Implementing Low Carbon Public Transport in Jakarta Project

Renewable Energy & Energy Efficiency Project (REEEP)

Project ID 108010494

Report 1

Technical Specification on Cleaner Fuel Buses for Direct Service

March 2012

ITDP | Institute for Transportation & Development Policy

Promoting sustainable and equitable transportation worldwide.

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Chapter 1
Background : Direct Service Concept

1.1 Introduction

Transjakarta, the first Bus Rapid Transit (BRT) system in Indonesia, started in 2004. As of February 2012 11 Corridors, with 180 km long are in operation and served by 206 stations and 560 buses, 480 of which run on Compressed Natural Gas (CNG).

The system currently carries 380 passengers daily. However, this is still considered not optimum as there are some problems which holds back transjakarta's potential to carry passengers, one of which is the lack of Direct service to serve passengers from the origin "first-mile" to Transjakarta

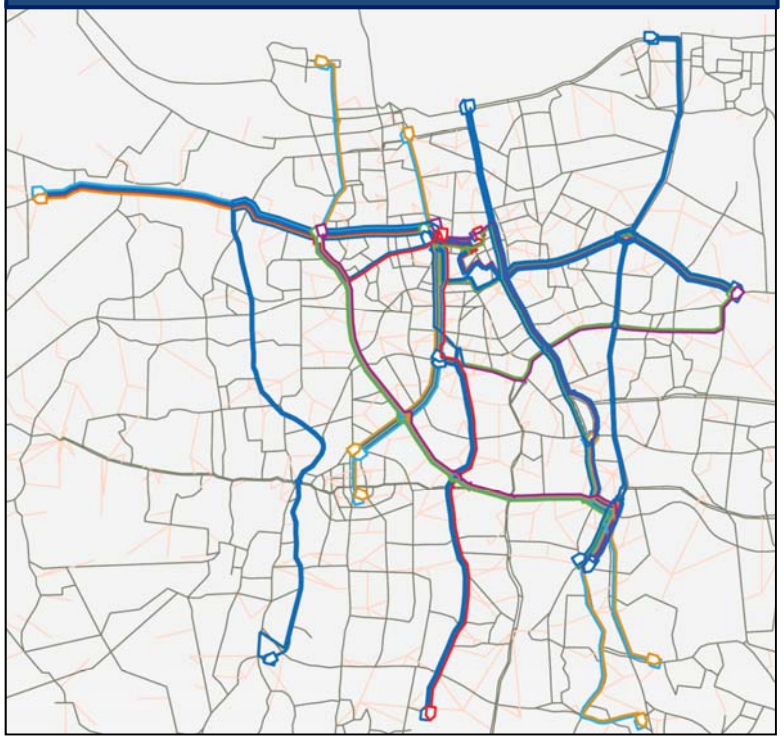
ITDP survey in 2010 revealed that 75% of Transjakarta passengers take medium buses or micro buses to access the Transjakarta system, despite the poor conditions of the buses. From the vehicle registration data source owned by Jakarta Transport Agency (2010), the average age for medium buses are 22 years, whereas 98% of the fleet are above 13 years old (KPMG Analysis of the data).

The fact that these medium buses carry substantial number of passengers to Transjakarta makes the effort to transform medium buses into Transjakarta Direct Service seems relevant and logic. It is estimated that by doing this measure, Transjakarta will have additional passengers by almost 50% of their current ridership.

REEEP Project "Implementing Low Carbon Public Transport in Jakarta" will outline plans and measures to be taken to implement the tranforming medium buses to become Transjakarta Direct Service.

This Technical Specification Report elaborate the suitable fleet technical specification for the Transjakarta Direct Service.

Figure 1.1: Transjakarta 10 Corridors (December 2011)



Source: ITDP Mapping

1.2 Direct Service Concept

The so-called “Direct” Service that ITDP is currently proposing would create such non-Transfer service from the non-BRT Corridor integrating with Transjakarta Trunk Corridor, as shown in Figure 1.2 and 1.3

Such integration would minimize transfer for passengers when entering Transjakarta system, as the proposed Direct service would serve main Transjakarta corridor, enabling passengers to get off at Transjakarta stations.

The concept of Direct Service would see many medium bus routes overlapping with Transjakarta to be transformed into the Direct Service. Currently, there are at least 30 medium bus routes which has overlapping section by more than 50% with Transjakarta corridors, thus makes it ideal to serve as Transjakarta Direct Service.

Figure 1.2: Concept of Direct Service

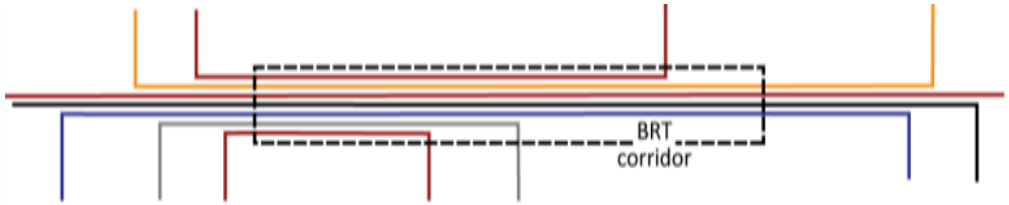
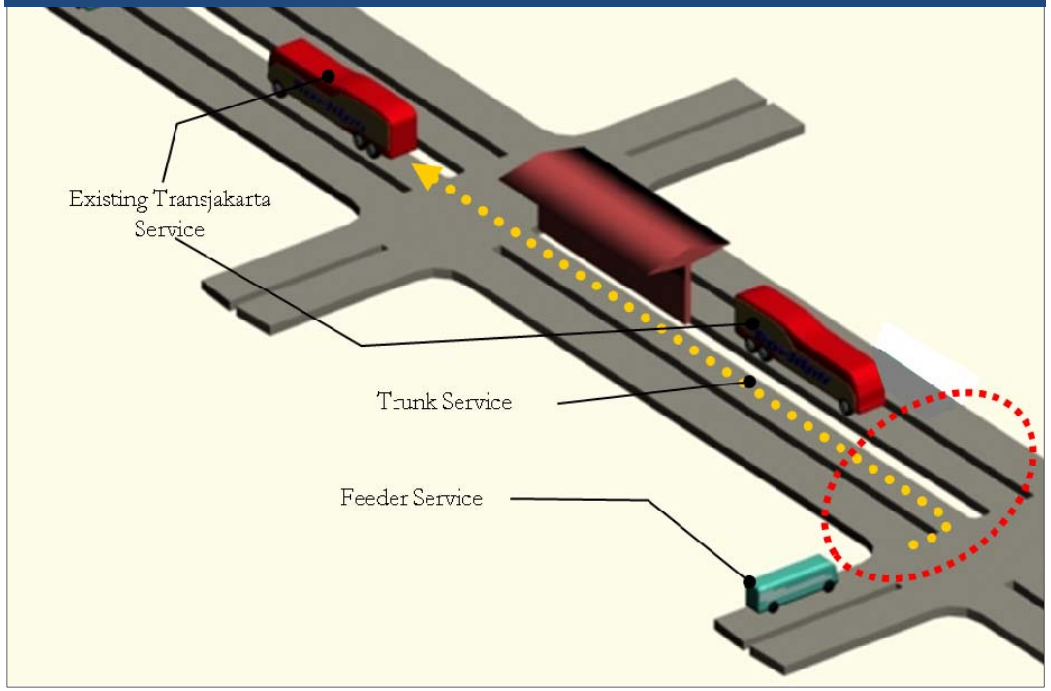


Figure 1.3: Illustration of Transjakarta Direct Service



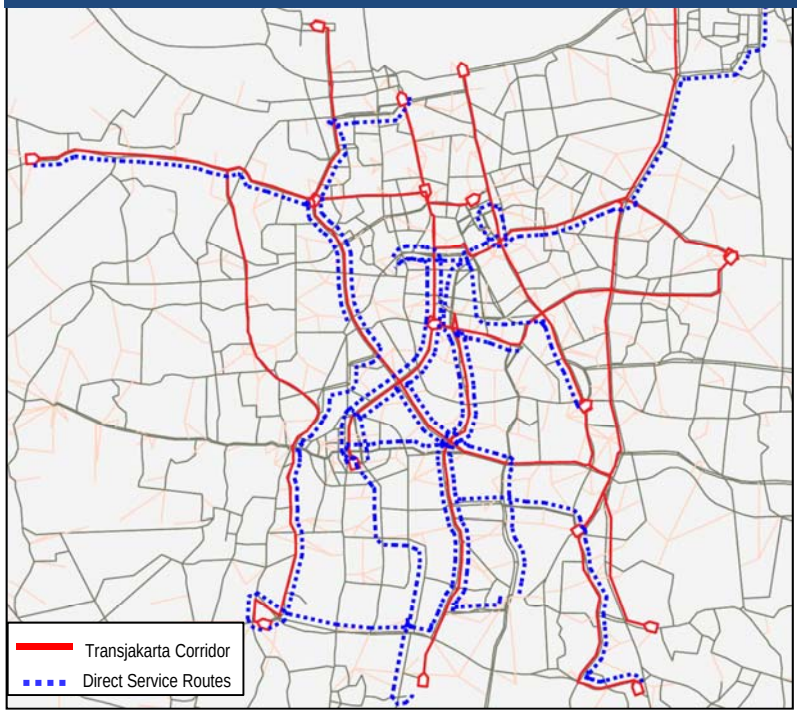
1.2 Direct Routes Proposal

With the Direct Serviice, the current medium buses service will be transformed into Transjakarta services. This concept would make the bus to serve Transjakarta stations whilst still serving passengers Off-Trunk corridors.

The selection of the routes to become Direct routes is based on the percentage of overlapping with Transjakarta Corridors. Currently there are 10 routes identified to be suitable as Direct Service routes, as shown on macro level in **Figure** 1.4.

To provide such service, the fleet needs to be specially designed to enable dual boarding from Transjakarta high platform station and from off-corridor street level entrance. Illustration of such fleet can be found in Ahmedabad Janmarg-BRT system as shown in **Figure** 1.5

Figure 1.4: Transjakarta Corridor with Direct Service Routes



Source: ITDP Mapping

Figure 1.5 : Fleet of Janmarg BRT (Ahmedabad) with low entrance (left) and high entrance (right)

1.3 Fleet Type and Capacity

Whilst there are many options available to choose the suitable fleet design, the following criteria sets out the parameters when selecting the fleet type:

1. Capacity : 30 to 40 passengers
   From the transport survey conducted on several routes, the average number of passenger inside the bus during the peak hour is between 15 to 20 passengers per bus. Thus providing medium sized buses with capacity for 30-40 passengers is considered suitable to cater the demand.

2. Access Type : Two level dual side boarding
   To enable buses serving both the off-trunk line section and Trunk Line, thus the bus should have doors in two sides, with off-trunk line entrance from the left side, and Trunk Line entrance from the right side. Also, since the Off-trunk line entrance would be from the street level, thus the door on the left side should have lower entrance than the right side.

3. Length : Between 8 to 10 meters
   Limiting the vehicle length to 10 meter is closely related with the fact that most of Direct Service routes serve narrow streets with small turning radius. The current regular medium buses in operation now have length between 7 to 8 meters.

4. Width : Maximum of 2.5 meter
   Similarly with length, maximum width of 2.5 meter is due to the street condition where the Direct service will be in running.

5. Fuel Type : Low Emission Engine
   It is important to state here that the Jakarta Government is endorsing the use of Compressed Natural Gas (CNG) for public transport in Jakarta. Thus endorsing the Direct Service fleet to use CNG fuel are in line with the city policy. However, this policy does not seem to be supported from the natural industry, that despite such policy to promote natural gas exists, the supply and quality of the natural gas for vehicles are still not adequate. This is clearly shown by how 500 Transjakarta buses running on CNG fuel have been experiencing problems in getting adequate supply of CNG to support the operation. Thus, the specification proposed here does not limiting the fuel type to certain fuel, as long as it produce low emission.

Chapter 2
Defining Suitable Fleet for Direct Service

2.1 Desired Vehicle Performance for Direct Service

Figure 2.1: Location of Daughter System

Source: PT Pertamina, 2011

- Fuelling system: Fuel used must be available in Jakarta, environmental and climate friendly fuel, fuel stations are easy to find and close to the fleet's routes with adequate capacity for feeder fleet. Fuel price should also be a consideration, particularly in using the subsidized fuel and considering the regulation on National Energy Policy.
- Refilling Stations: Due to the limited number of CNG station which are located distant from some of the corridors, it takes time for TransJakarta bus to refuel at those stations and travel back to the corridor, the average refuelling time at each of the stations are 10-15 minutes since those 5 CNG stations have upgraded its machine into quick filling machine. However the travel time to the stations might be a burden to improve TransJakarta services. Due to this concern, PT Pertamina E&P planned to build 4 daughter stations closed to TransJakarta corridors, the fixed location are Kalideres, Cililitan, Ancol and Ragunan.

2.2 Level of Emission to be Expected

- The implementation of trunk/feeder system expected to reduce 88,206 tCO2 emission from BRT TransJakarta operation in 2012. Currently, total GHG emission reduction from January – December 2011 of about 54,992 tCO2, with total CO2 emission reduction due to shifting mode to TransJakarta in period 2004 – 2011 is about 221,615 tCO2.

- The increase of CO2 emission reduction in 2011 was due to the opening of corridor 9 and 10, since the shifting from the Private Motor Vehicle (PMV) was not increase significantly. Thus, the trunk/feeder system expected to increase the shifting passenger due to a more efficient and integrated bus system.

- As a realization to Indonesia's Commitment to reduce 26% GHGs emission voluntarily and additional 15% with international support, the GoI has issued National Action Plan to Reduce GHGs (RAN GRK) in September 2011, thus each province including DKI Jakarta should provide Local Action Plan to reduce GHGs Emission (RAD GRK). DKI Jakarta estimated 45,58% GHGs emission in 2005 (baseline year) is from transportation, thus, some actions listed in the RAD GRK to reduce GHGs emission from transport sector are BRT, Non Motorized Transport, MRT, ITS, Parking and ERP

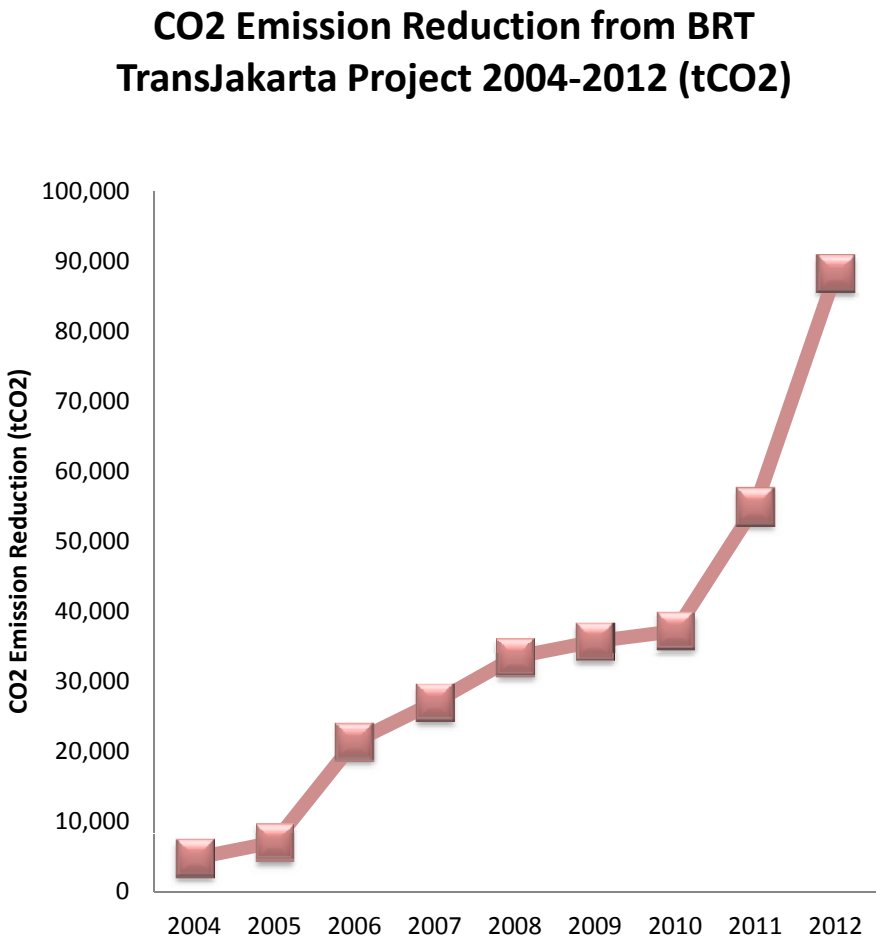


Figure 2.2: CO2 emission reduction from BRT TransJakarta 2004 – 2012 (tCO2)

Chapter 3
Fuel Type : Diesel or CNG?

Diesel or CNG?

Various regulations on fuel for transportation is remained as a consideration in creating a suitable fuel for fleet services. Thus, those regulations are:

• President Regulation No 61 Year 2011 on Local Action Plan to Reduce Greenhouse Gases Emission, mentioned climate change mitigation activities on Energy and Transportation included the use of natural gas as fuel for transportation, BRT and fleet management, Non Motorized Transport (NMT) and Transport Demand Management (TDM)

•President Decree No 5 year 2006 on National Energy Mix Policy, mentioned that the use of natural gas will be increase from 28% in 2006 to 30% in 2025. Fuel for transport sector particularly land transport predicted to be obtained from natural gas and biofuel

•Minister of Energy & Mineral Resources Decree No. 2932 K/12/MEM/2010 on CNG price for Transport Sector in Jakarta, determined the price of CNG for transport sector at Rp 3,100,-

•Minister of Energy & Mineral Resources Regulation No. 19 year 2010 on the allocation of Natural Gas for Transport Sector, determined the percentage allocation of Natural Gas for Transport Sector from total traded Natural Gas through the steps as follow;

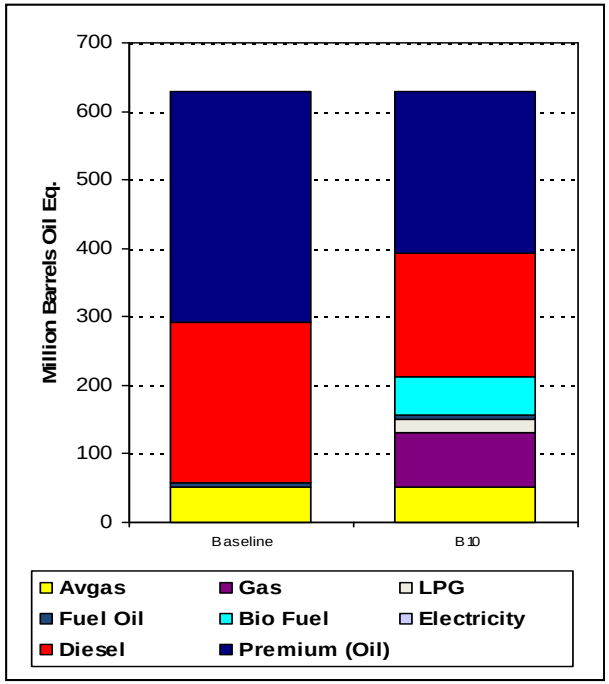
10% in 2011 – 2014
15% in 2015 – 2019
20% in 2020 – 2024
25% in 2025 and so on

•Directorate General of Oil and Gas Ministry of Energy and Mineral Resources Decree No. 247.K/10/DJM.T/2011 on Specification of CNG fuel for Transport Sector exclusively for Domestic Market.

•DKI Jakarta Local Regulation No. 5 year 2005 on Air Pollution Control.

•DKI Jakarta Governor Decree No. 141 year 2007 on the use of natural gas fuel for official government vehicles and public transport.

Figure 3.1: National Energy for Transport Sector



Source: Ministry of Energy and Mineral Resources, 2006

3.1 The Benefit of Diesel

- Diesel technology vehicle has developed very fast into more efficient modes. It saves 20% of its fuel consumption compares to gasoline vehicle with similar capacity. However, diesel vehicle usually emit some amount of NOx and PM which are likely to cause cancer. Another compound emitted from diesel vehicle is Sulfur which is not only impacted to human health but also to vehicle engine. The Sulfur content in average Diesel fuel in Indonesia is about 2000 ppm.

- Based on Gaikindo data in 2010, diesel vehicle sales reach into 56% of total vehicle sales in Indonesia. In fact, the quality of diesel fuel for vehicle in Indonesia is still below euro standard, the Pertamina oil & gas company also sells a better quality of diesel fuel (imported diesel), the PertaDex brand, however the price of PertaDex IDR 9,450/Litre, is two times more expensive than common diesel with price IDR 4,500/Litre. Thus, the bus operator would prefer to use the common diesel for their fleet, and even an illegal mix diesel with kerosene (which is cheaper), but emitted more PM and NOx .

Table 3.1: Diesel Fuel specification in Indonesia

No	Characteristic	Units	Limits		Testing methods
			Min.	Max.	ASTM
1	Cetane Numbers				
	- Cetane Numbers or	-	48	-	D 613 - 95
	- Cetane Index	-	45	-	D 4737- 96a
2	Specific Mass (at 15 ?C)	kg/m3	815	870	D 1298 or D 4052-96
3	Viscosity (at 40 ?C)	mm2/s	2.0	5.0	D 445 - 97
4	Sulfur Content	% m/m	-	0,35 1)	D 2622 - 98
5	Distillation :				D 86 - 99a
	T 95	?C	-	370	
6	Flash Point	?C	60	-	D 93 - 99c
7	Pouring Point	?C	-	18	D 97
8	Carbon Residue	% m/m	-	0.1	D 4530-93
9	Water Content	mg/kg	-	500	D 1744 -92
10	*Biological growth* *)	-	Not Exist		
11	FAME Content *)	% v/v	-	10	
12	Methanol and Ethanol Content *)	% v/v	Not Detected		D 4815
13	Cooper Corrosion	merit	-	Class 1	D 130 - 94
14	Ash Content	% m/m	-	0.01	D 482 - 95
15	Sediment Content	% m/m	-	0.01	D 473
16	Strong Acid Number	mg KOH/g	-	0	D 664
17	Total Acid Number	mg KOH/g	-	0.6	D 664
18	Particulate	mg/l	-	-	D 2276 - 99
19	Visual Appearance	-	Clear and Bright		
20	Color	No. ASTM		3.0	D 1500

Source: Ministry of Energy and Mineral Resources, 2006

Subsidized Fuel Consumption

- To increase the diesel quality to reach Euro 2 Standard, PT Pertamina should invest a new refinery system with capacity 300 MCBD to provide 4,7 million KL gasoline and 2,3 million KL diesel. Thus the investment cost estimated USD 500 million. However, this investment, will also increase fuel subsidize in about USD 0,2-0,8 cent/litre for gasoline and USD 0,5-0,8 cent/litre for diesel (National Council on Climate Change, 2011)

- Based on Japtrapis research in 2011, the retail price for fuel in Indonesia is 58% below the international market prices and 67% for diesel, while 14% and 35% in China and 20 % in India. In Indonesia total subsidized fuel consumption in 2010 reach to 38,4 million KL, and Jabodetabek area consumes 30% and total Java-Bali Island consumes 59% of the national consumption.

Table 3.2: Subsidized fuel consumption and amount (2006-2010

	2006	2007	2008	2009	2010
Subsidized Fuel Consumption (Million KL)	37,4	38,6	39,2	37,7	38,4
Subsidized Fuel Amount (Trillion Rupiah)	64,2	83,8	139,1	45	81,1

Source: Ministry of Energy and Mineral Resources, 2011

3.2 The Benefit of CNG

- CNG characteristic naturally have a lower NOx, PM and Sulfur emission compare to conventional diesel in Jakarta. Comparing the current CNG bus with conventional diesel bus in Jakarta, at the same distance trip (19 million Km), diesel bus emitted 18t SO2, 27t PM10 and 210t CO, while CNG bus emitted 0t SO2, 1t PM10 and 12t CO.

- While in equal vehicle capacity, the GHGs emission from CNG vehicle usually 15-20% lowers than gasoline vehicles, since natural gas has lower carbon content per unit of energy than gasoline. But the CNG have about the same GHGs emission as diesel fuel vehicles.

- However, the challenge to promote the use of CNG are CNG station infrastructure and the bus manufacturer in Indonesia. Currently, 5 CNG stations available for TransJakarta BRT and 2 bus manufacturer that produce CNG bus for Single (12 m) and articulated bus for TransJakarta.

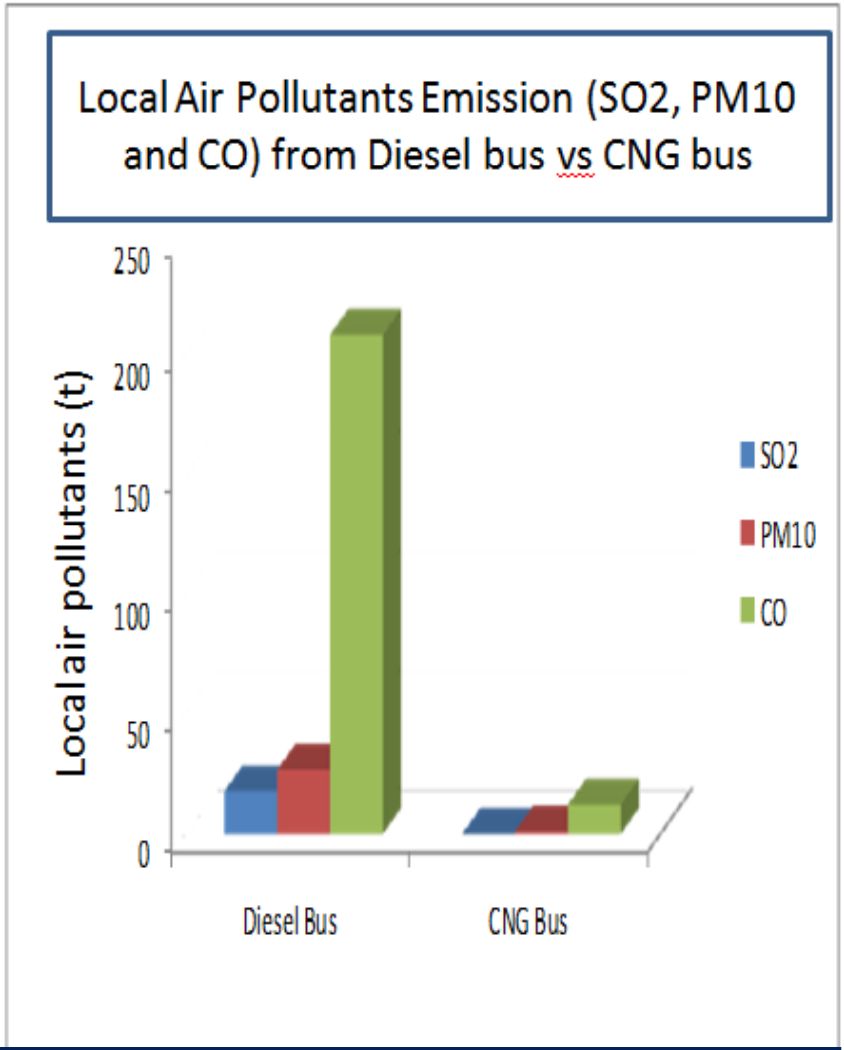


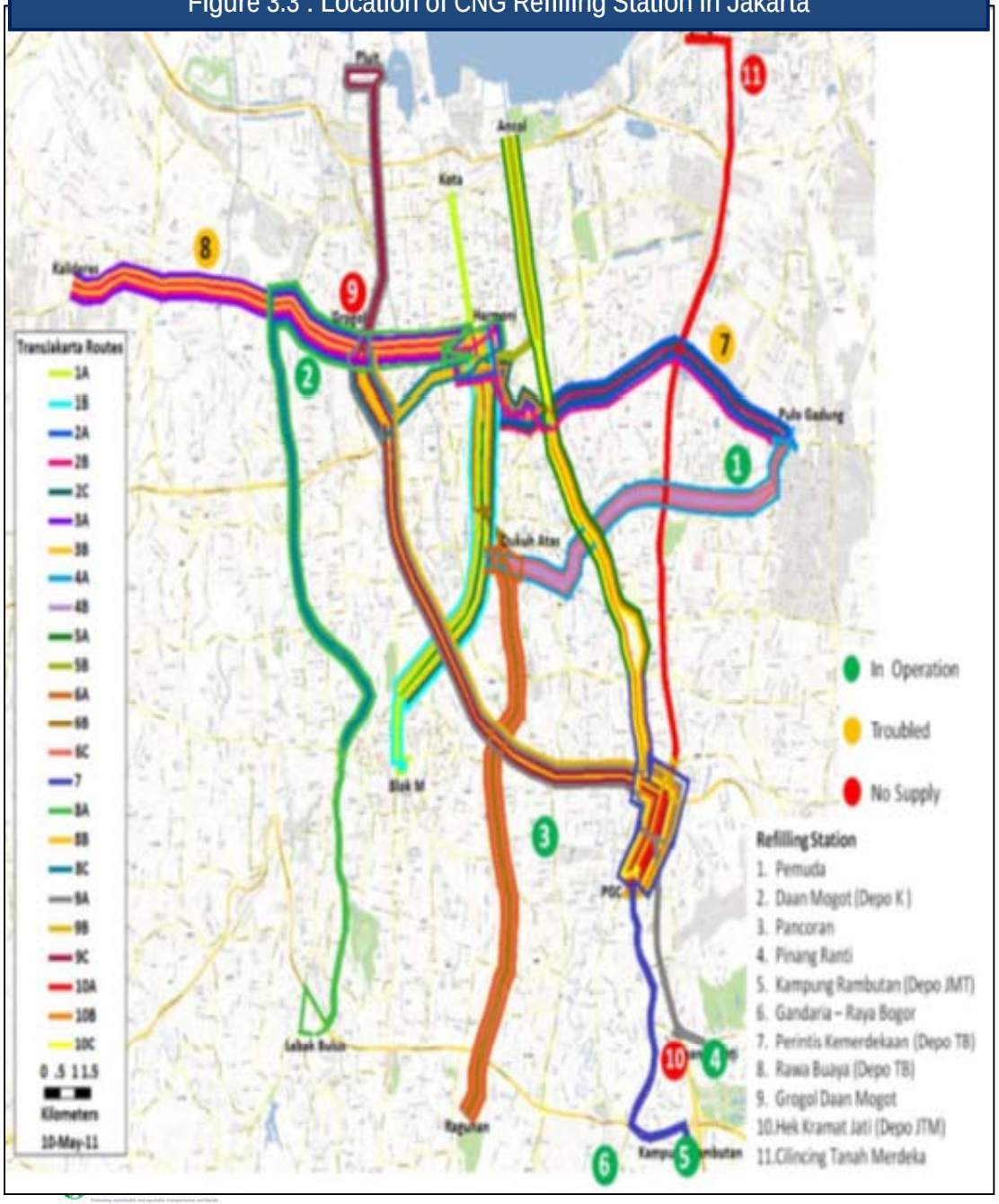
Figure 3.2 : Local Air Pollutants Emission from Diesel and CNG Bus

CNG Refilling Stations

- Currently, TransJakarta BRT consume 2,8 MMSCFD CNG from 4 MMSCFD CNG supply from PT Pertamina. DKI Jakarta Governor asked a guarantee of CNG supply to National Government in amount of 6.8 MMSCFD for 2010 and 12 MMSCFD for 2015 which are enough to supply TransJakarta bus until 15 Corridor and other official vehicles of DKI Jakarta Government *(source: DKI Jakarta Energy and Industry Agency, 2010)*. Thus, PT Pertamina will provide 4 additional CNG daughter stations and 2 more CNG stations will be developed by PT Pertamina at Perintis Kemerdekaan depot and Rawa Buaya depot. Those additional 6 CNG stations should be operated on the 2nd semester of 2012

- The current CNG price is IDR 3,100 without subsidy. This price remain lower than the subsidized fuel. The CNG price in Jakarta is determined in the Minister of Energy & Mineral Resources Decree No. 2932 K/12/MEM/2010 on CNG price for Transport Sector in Jakarta

Figure 3.3 : Location of CNG Refilling Station in Jakarta



3.3 Combining the Two: Creating a Sustainable System with Different Fleet Arrangement

CNG Fleet Recommendation

- Add more CNG stations in considering the future feeder fleet. The CNG stations should located close to the trunk/feeder routes. The stations should have a dryer system to remove water content from the gas.
- Tax holiday for climate & environmental friendly technology includes CNG bus fleet, its component and CNG tank. The quality of CNG tank should be guaranteed by the manufacturer. The maintenance of bus fleet should be part of after sales services that mentioned in the contract.

Diesel Fleet Recommendation

- The quality of diesel fuel used should be improved, the options are: 1) import cleaner diesel with euro 3 or euro 4 standard, which will increase operation cost since the price will be higher or 2) Invest some new refinery for cleaner diesel which will increase the fuel subsidy and become a burden for the national budget
- Eliminate the use of illegal mix diesel (with kerosene) for public transport. Optimized the vehicle inspection (KIR test) and its maintenance
- Renew some of the diesel fleet, particularly for feeder bus. The current medium bus (Kopaja and Metromini) condition should be improved to meet the needs of the Private Motor Vehicle users, to induce mode shift to public transport.

Chapter 4
Technical Fleet Specification for Direct Service Bus

4.1 Introduction

Bus will be operated on both Trunk and Off Trunk Corridor, thus allowing passengers to have free Transfer at Transjakarta stations for multiple trips. With this requirement, the bus specification should allow doors on both side. The near-side (left) door will be used during the off-trunk section, with entrance height of 300 mm. Whereas on the Transjakarta station, high-floor door (height 1100 mm) will be used, mostly on the right-hand side. Although in special circumstances, the left-hand side high-floor door will be used for the Transjakarta station located on the near side.

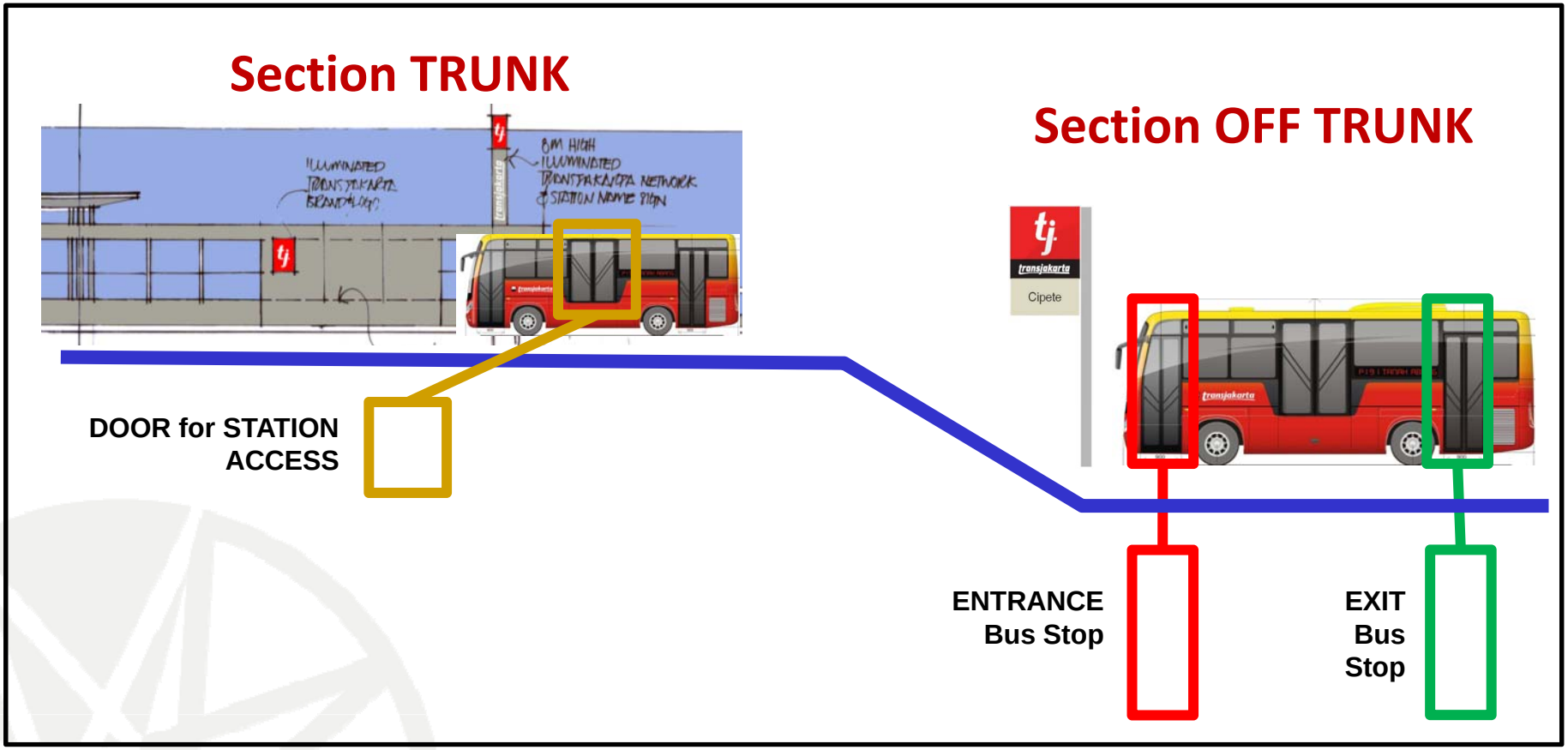


Figure 4.1 Illustration for Direct Service in Off Trunk and Trunk Line

Cross Section Diagram for Off-Trunk Section

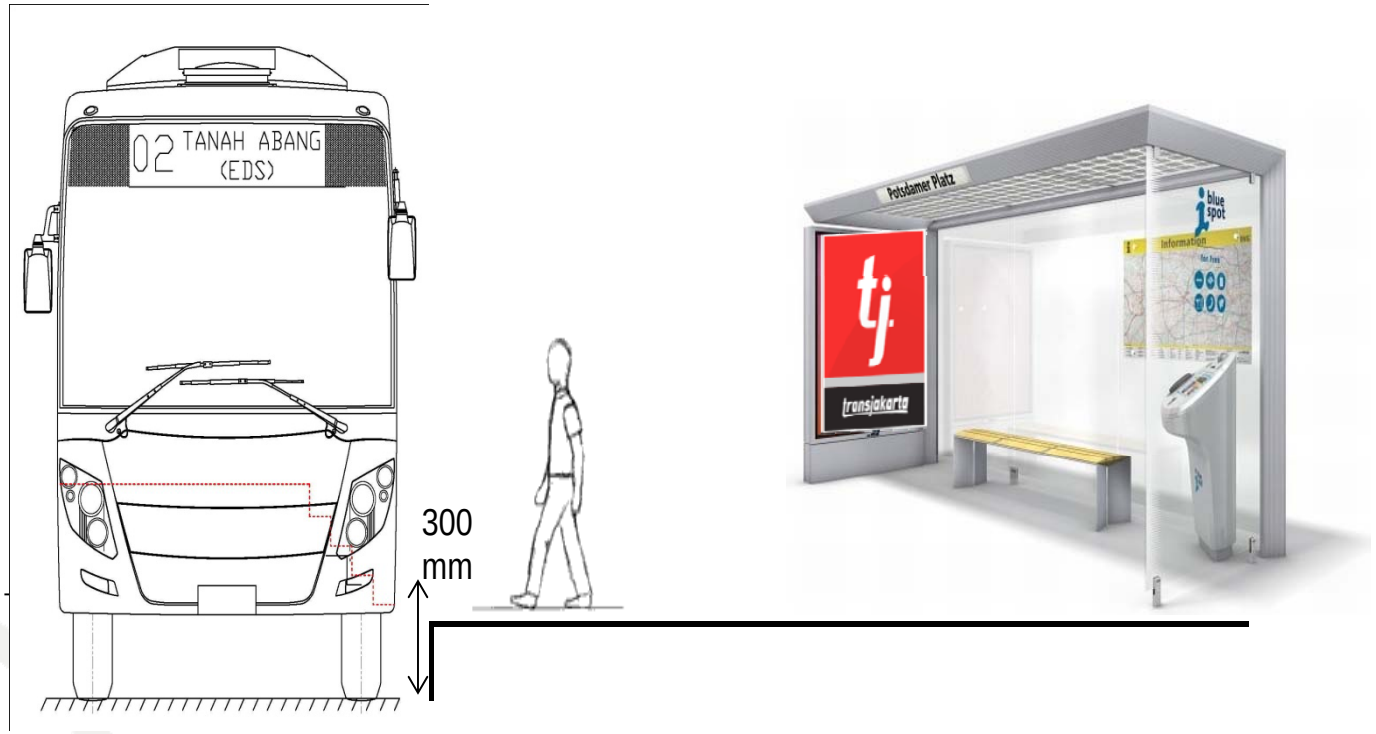


Figure 4.2 Cross Section Illustration For off-Trunk Line

Cross Section Diagram for Trunk Section

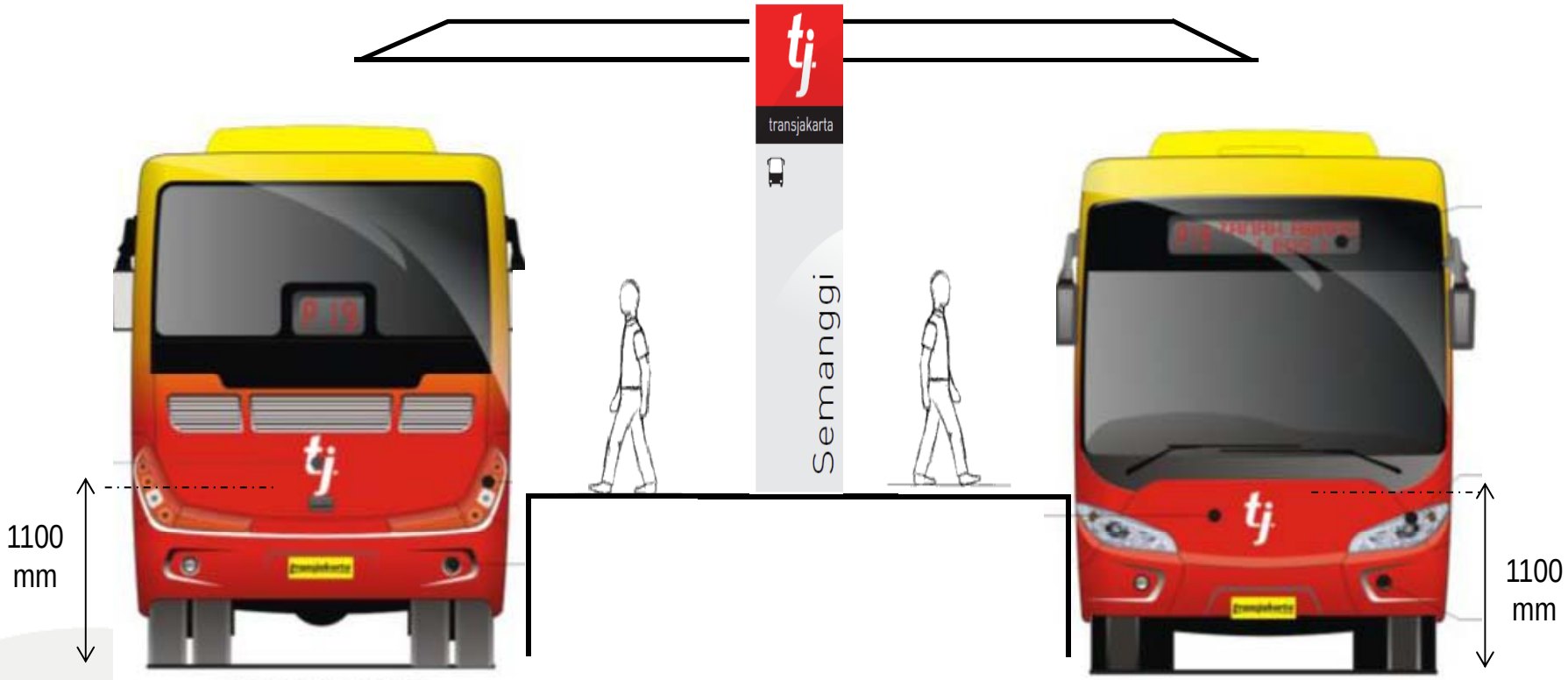


Figure 4.3 Cross Section Illustration For Trunk Line Service

In the trunk line service, feeder bus taking passengers both sides. This design is a solution for the position the existing station

4.2 Condition of Existing Fleets

- Metromini/Kopaja

Metromini/Kopaja is a popular mode of public transit in Jakarta. Despite its old age and poor quality, they are still frequently used by commuters. Kopaja buses have 20-30 seat and overall length is 7 – 8 meter. They have width maximum 2.1 m. These buses often exceed the capacity during peak hour. Also from the safety point of view, most of the buses are deemed not safe to operate. They also produced significant amount of pollution caused by inadequate combustion from the old engine.

Figure 4.4 Metromini/Kopaja Buses

Kopaja A/C

To tackle its deteriorating condition, in 2011 some Kopaja owners started the transformation program by investing in new, cleaner and air conditioned (A/C) fleet with controlled entrance barrier and guard to increase security.

Despite these many efforts, low occupancy still occur on the S13 routes which has already implemented this system.

Figure 4.5 Kopaja New A/C Fleet

4.3 Engine – Chassis Specification

Engine

- Established engine design is full dedicated CNG engine with emission standard EURO II.
- Despite CNG Engine (Fuel gas) is a required by local regulation DKI Jakarta, an option for diesel engine is still left open
- Minimum displacement is 5000 cc with integrated ECU.
- Power of the bus is designed minimum 220 HP and has minimum 70 kgm Torque.
- Location of CNG system (Tanks, Pipe) is fixed beneath the chassis with minimum capacity 1000 liter water volume.
- CNG Tank must fulfill the ISO 11439, and use Type 1 (Full Steel) or Type 4 (Full Composite).
- Comfortability and efficiently aspect should be supported with design automatic transmission integrated retarder and full air spring suspension.
- Gradeability 25 – 40 % and maximum speed 80 – 100 km/hr.
- While for safety aspect, these buses adopt full air brake system.

Chassis Dimension

- Overall length design 8000 – 9000 mm and overall width design maximum 2.500 mm.
- Front and Rear overhang is based on national standard: Front overhang Maximum Wheel base x 0,475, rear overhang is maximum wheel base x 0,675.

4.4 Body & Interior Specification

- Body construction is dedicated high floor bus, with some modification for front and rear door for lower floor access.
- Design body structure is light and integrated .
- Structure frame is made by mild steel square & rectangular tube (national standard) with outer layer is made by galvanized steel.
- Door frame design: center door width minimum 1600 mm (both side), while rear and front door on the left side minimum width is 900 mm.
- Minimum Height from floor to roof for standing space is1.900 mm
- Maximum ground clearance is 300 mm.
- Material ducting using SECC (electro galvanized steel plate).
- For Cowl and panel material using GRFP.

Drawings

gambar aplikasi desain

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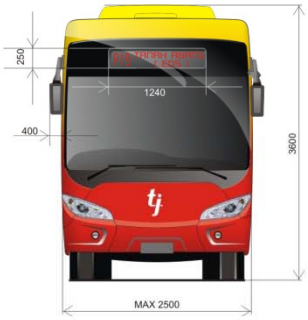
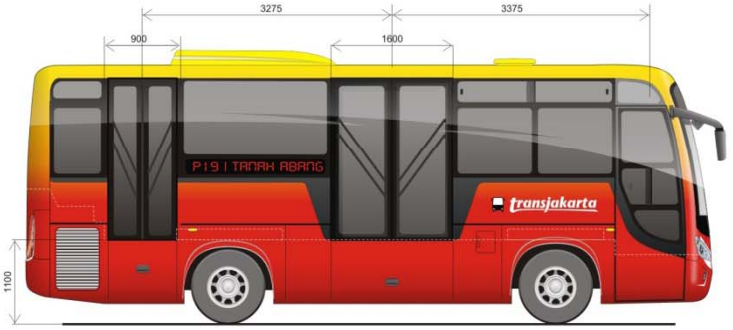
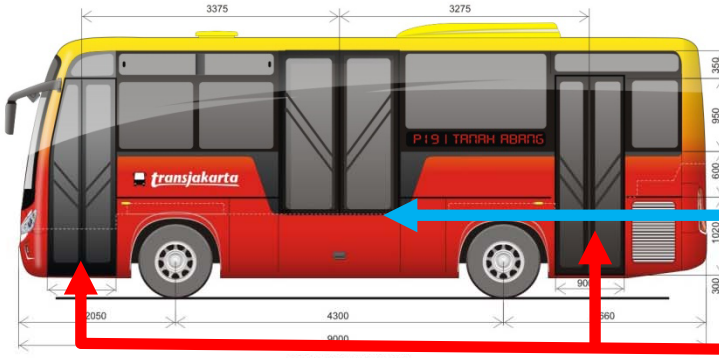
TAMPAK BELAKANG



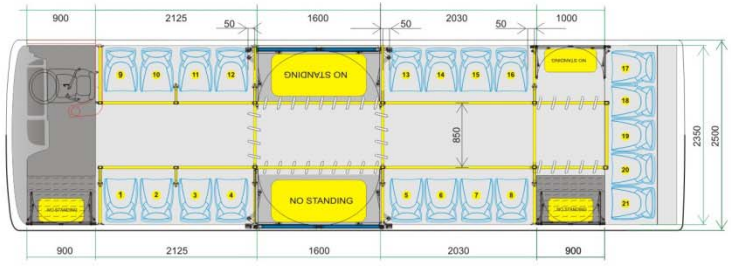
TAMPAK DEPAN



TAMPAK SAMPING KANAN



TAMPAK SAMPING KIRI



LAYOUT SEATS VIEW

Catatan:
Dimensi luar kendaraan hanya sebagai panduan. Batas yang diperbolehkan untuk dimensi kendaraan wajib mengacu ke dokumen spesifikasi teknis

LEGENDA

- Vertical Handrail
- Vertical rail ke ceiling
- Hand Grip
- Bi-Folding Door
- LED Display Samping
- LED Display Samping
- LED Display Belakang

Height 1100 mm

Height 300 mm

<u>DIMENSION</u>

Length : 9.000 mm
Width : 2.500 mm
High Floor Access Width : 1.600 mm
Low Floor Access Width: 800 mm

GAMBAR EKSTERIOR DESAIN FEEDER TRANSJAKARTA

Figure 4.6 Fleet Layout View

Date : May, 2012
Scale : Not to Scale
Unit : MM

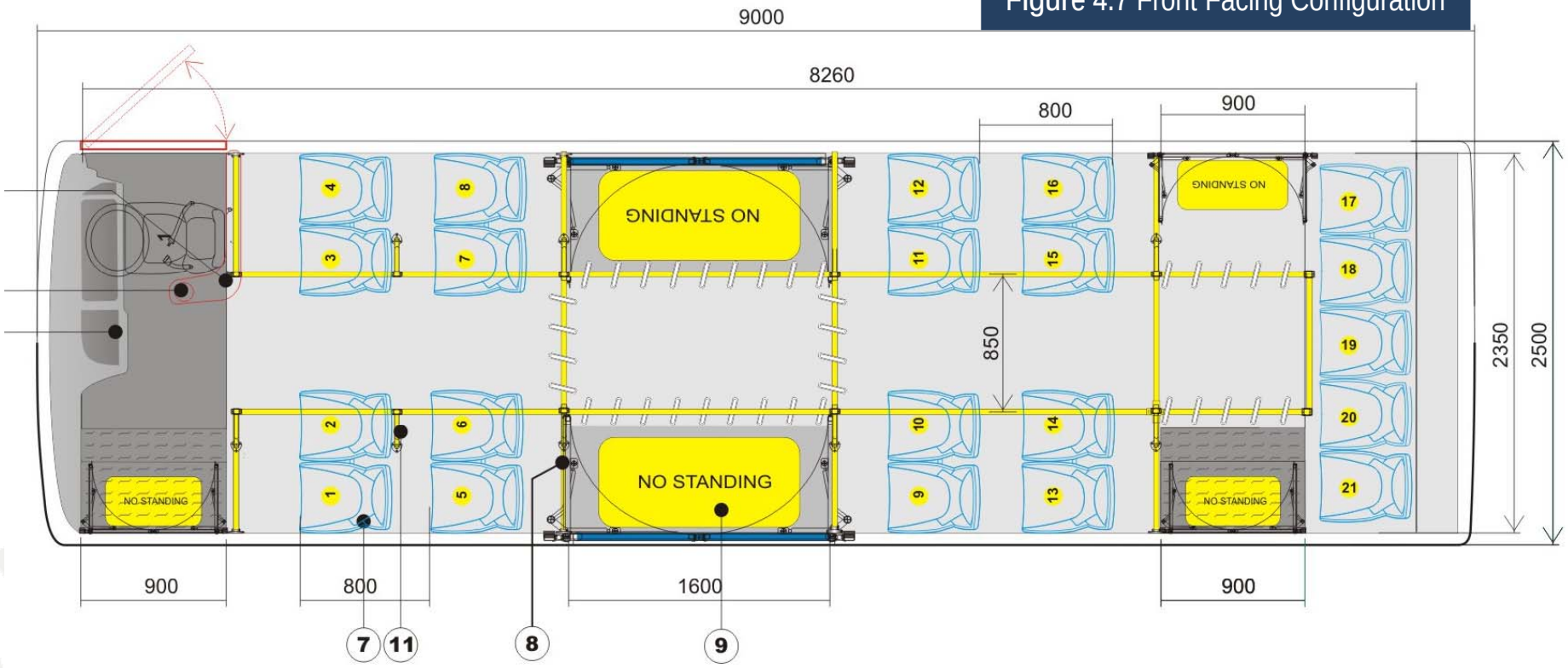
Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN
PROVINSI DKI JAKARTA

Seat Layout : Front Facing

No of Seats: 18
No of Standings: 20 - 24
Gap between Seats: 30 cm

Figure 4.7 Front Facing Configuration



With this concept, seats are reduced to provide more space for standing. This will allow bigger distance between passengers. The front facing configuration is already used in Kopaja and Metromini buses

gambar aplikasi desain

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GAMBAR EKSTERIOR
DESAIN FEEDER
TRANSJAKARTA

Figure 4.8 Fleet Rendering

Date : May, 2012
Scale : Not to Scale
Unit : MM

Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN
PROVINSI DKI JAKARTA

gambar aplikasi desain

AUTOMOTIVE & INDUSTRIAL DESIGN CONSULTANT furoda

GAMBAR EKSTERIOR DESAIN FEEDER TRANSJAKARTA

Figure 4.9 Fleet Rendering

Date : May, 2012
Scale : Not to Scale
Unit : MM

Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN
PROVINSI DKI JAKARTA

gambar aplikasi desain

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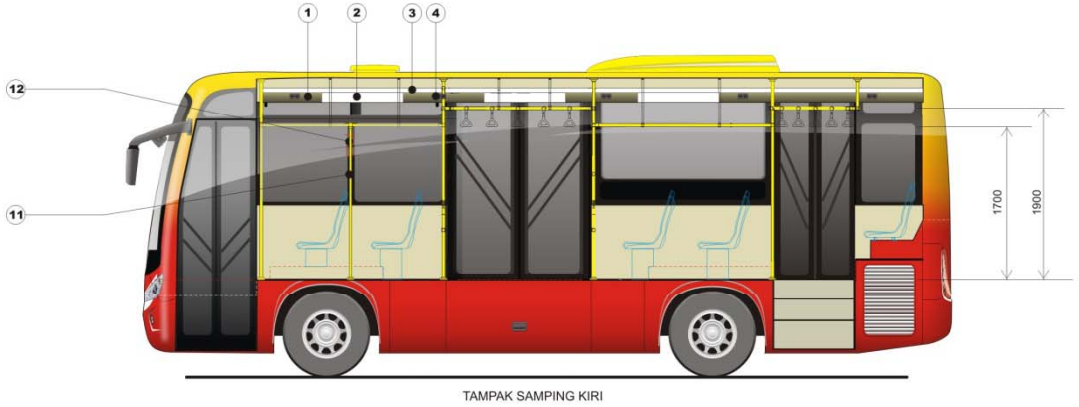
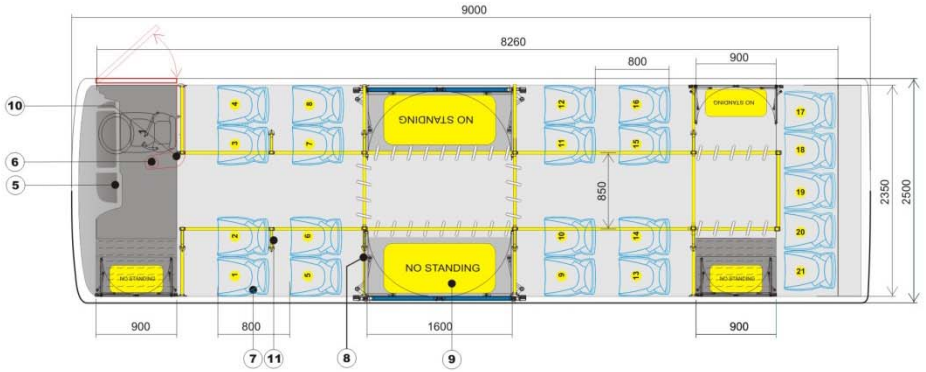


TAMPAK SAMPING KIRI



Catatan:
Dimensi luar kendaraan hanya sebagai panduan. Batas yang diperbolehkan untuk dimensi kendaraan wajib mengacu ke dokumen spesifikasi teknis

LEGENDA

- Vertical Handrail
- Vertical rail ke ceiling
- Hand Grip
- Bi-Folding Door
- Kursi Hadap ke Depan

No	Keterangan	Material
12	Palu Pemecah Kaca Darurat	-
11	Vertical Handrail	Pipa Stainless
10	Partisi / Konsol Belakang Supir	Fiber Molding
9	Area dilarang berdiri	Karpet Kuning
8	Partisi Pintu Otomatis	Pipa Stainless
7	Kursi Penumpang	Plastik
6	Tabung APAR	-
5	Konsol Panel area tombol Operasi Pintu otomatis	Fiber
4	AC Louver	Plastic
3	Cover Lampu Interior	Acrylic Sheet
2	Panel Peta Penunjuk Koridor	Print Sticker
1	Ducting AC	Plat Alumunium

GAMBAR EKSTERIOR DESAIN FEEDER TRANSJAKARTA

Figure 4.9 Seating Configuration

Date : May, 2012
Scale : Not to Scale
Unit : MM

Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN PROVINSI DKI JAKARTA

gambar aplikasi desain

AUTOMOTIVE & INDUSTRIAL DESIGN CONSULTANT furoda

GAMBAR INTERIOR DESAIN FEEDER TRANSJAKARTA

Figure 4.10 Interior View

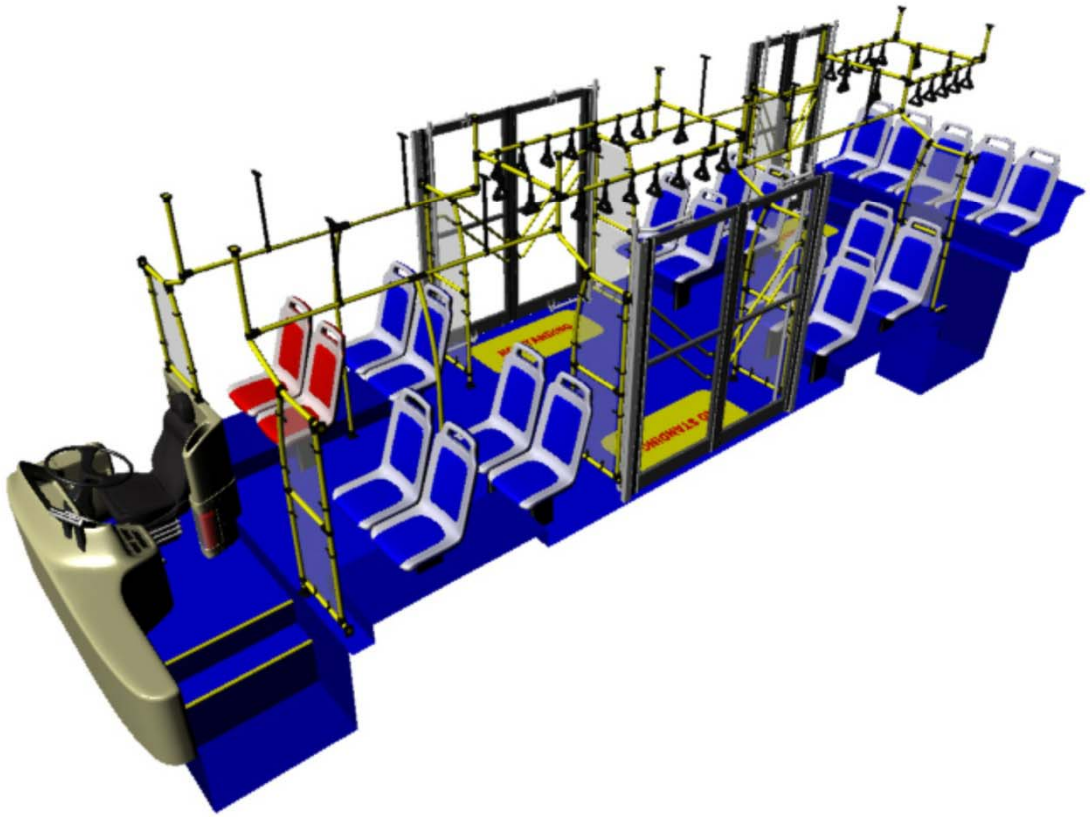
Date : May, 2012
Scale : Not to Scale
Unit : MM

Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN PROVINSI DKI JAKARTA

gambar aplikasi desain

AUTOMOTIVE & INDUSTRIAL DESIGN CONSULTANT furoda



GAMBAR INTERIOR DESAIN FEEDER TRANSJAKARTA

Figure 4.11 Interior View

Date : May, 2012
Scale : Not to Scale
Unit : MM

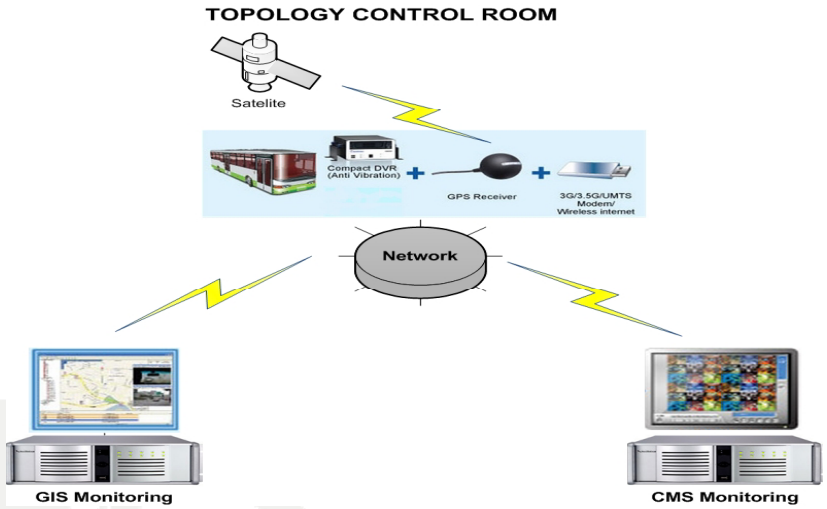
Digambar	furoda	TTD TGL 22/03/2011
Diperiksa	ITDP	TTD TGL
Disetujui	Ir. Udar Pristono, MT Kepala Dinas Perhubungan	TTD TGL

DINAS PERHUBUNGAN PROVINSI DKI JAKARTA

4.5. Supporting Equipment Specification

- Fleet Control and Communication System

For communication each buses has 1 set radio communication, fleet management equipment including GPS, and CCTV camera. There are 2 CCTV camera on the top front door and rear door. CCTV camera is equipped feature object counting.



Inside the bus has also provide route map information board. Moreover, available voice announcement systems with 2 LED panel display. LED display is integrated with voice announcer.

Lighting inside the bus is fluorescent tube lamp alongside passenger.

Figure 4.12 Topology Control Room

Driver Cabin and Panel

Dashboard equipment is GFRP or ABS panel with erg

- Speedometer
- Air pressure
- Engine cut off
- Fuel level meter digital reading
- Warming light
- Oil pressure
- Battery charging
- Main beam
- Handbrake indicator
- Low air pressure
- Low coolant level
- Warming buzzer
- Ignition switch :Start & stop engine, CNG engine, electrical
- Hazard warming switch
- Speed limiter : buzzer, and engine cut-off to public announcement.

Figure 4.13 dashboard illustration

Handrail equipment is made steel PVC min Ø32 mm or stainless steel and equipped handgrip at the center door. While the horizontal grab standard is same with handrail equipment.

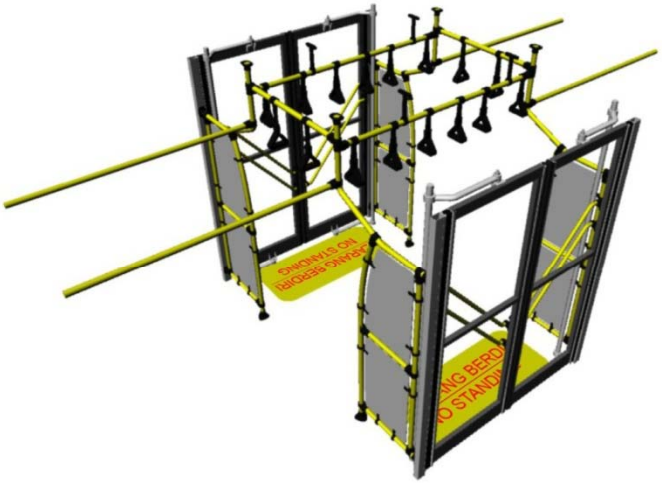


Figure 4.14 handrail and handgrip equipment

Chapter 5
Providing Reliability in Running the Direct Service

5.1 Maintenance Contract

Lesson Learned from Transjakarta

During the operation of the Direct service, it is important for the operator to put maintenance as priority. One of the lesson learned from Transjakarta operation is that bus operators most often put their maintenance activity as non-priority program. As a result, bus often experience faster wear and tear than it is expected, and many of the buses on their 3rd or 4th year of their operating year experience breakdown quite frequent.

During further investigation by interviewing Transjakarta staff who check the performance of the buses, quite often bus mechanics and maintenance staff do not have sufficient knowledge to do proper maintenance, particularly with CNG bus technology, which is relatively new in Indonesia. Therefore, some treatments that are not allowed to be performed in CNG buses can sometimes still be seen during the maintenance. One example is the activity of draining the CNG cylinders from water. In the beginning not all bus operators were aware that only certified mechanics are allowed to open the CNG cyclinder.

Lately , Transjakarta requires the new operator bidding to run the service to include the maintenance contract, where the bus maintenance are either conducted by the authorized dealer of the bus or under their close supervision and monitoring. With this measure, it is ensured that the bus have strict maintenance regime according to the manual book as released by the manufacturer.

Concept of Maintenance Contract

By introducing maintenance contract, bus operator can ensure the passengers that their buses are properly maintained in a good quality, although to guarantee the whole quality of service will still be the responsibility of the bus operator.

To start applying the maintenance contract, the authority will need to state it in the beginning of the tender process, thus the cost for such maintenance activity under the contract can be negotiated with the authorized dealer. This is important so that the operators have some sense on the cost of maintenance, and then include the cost into the bid.

The following list show some aspect to be mentioned in such maintenance contract:

1. Item of work to be included under maintenance contract
2. Quantity and volume of work
3. Spare parts quality and specifications
4. Cost per item of work with price adjustment formula for spare part cost increase
5. Guarantee period after work conducted

5.2 Quality Control: Supervising the Maintenance

- Item of work to be included under maintenance contract

Generally, there are six maintenance activities that needs to be conducted during bus lifetime:

1. Daily Checking for Oil and Grease
2. Interval Checking and Replacement for Engine & Moving Parts
3. Interval Checking for Electrical Components & Equipments
4. Interval Checking and Replacement for Power Train and Brake System
5. Interval Checking for Air Conditioning System
6. Interval Checking for Bodyworks and Interior

Activity #1 generally includes checking the oil, fluid and other greasing component for the moving parts. This activity is not considered complex and can be handled by bus operator's own mechanics.

For Activity #2, #4 and #6, these are where authorized dealer should play part, as maintenance in Engine, moving parts, power train, brake and air conditioning system are the most substantial work that need to be done in a strict manner, thus giving these works to authorized dealer are the most logical measure to avoid the risks of un-proper maintenance works. While the interval and regular checking can still be done by bus operator's mechanics, the roles of authorized dealer's mechanics are important to ensure the spare part replacement are done correctly, as well as conduct monitoring of the bus performance.

For Activity #3 and #6, although the expertise from bus operator's own mechanics are considered sufficient to perform such tasks, it is highly recommended that the bus operators contract authorized dealer to supervise and monitor the works on those maintenance activities.

The above recommendation is drawn from the facts that the cause of fire in Transjakarta buses were often started from the electrical and cable malfunction. Table 5.1 summarize the roles and responsibility of each party.

No	Maintenance Component	Regular Checking	Replacement	Monitoring
1	Oil and Grease	Bus Operator	Bus Operator	Bus Operator
2	Engine & Moving Parts	Bus Operator	Authorized Dealer	Authorized Dealer
3	Electrical Components & Equipments	Bus Operator	Bus Operator	Authorized Dealer
4	Power Train and Brake System	Bus Operator	Authorized Dealer	Authorized Dealer
5	Air Conditioning System	Bus Operator	Authorized Dealer	Authorized Dealer
6	Bodyworks and Interior	Bus Operator	Bus Operator	Authorized Dealer

Table 5.1: Roles for maintenance by each party

5.3 Monitoring and Evaluation as Part of Quality Control

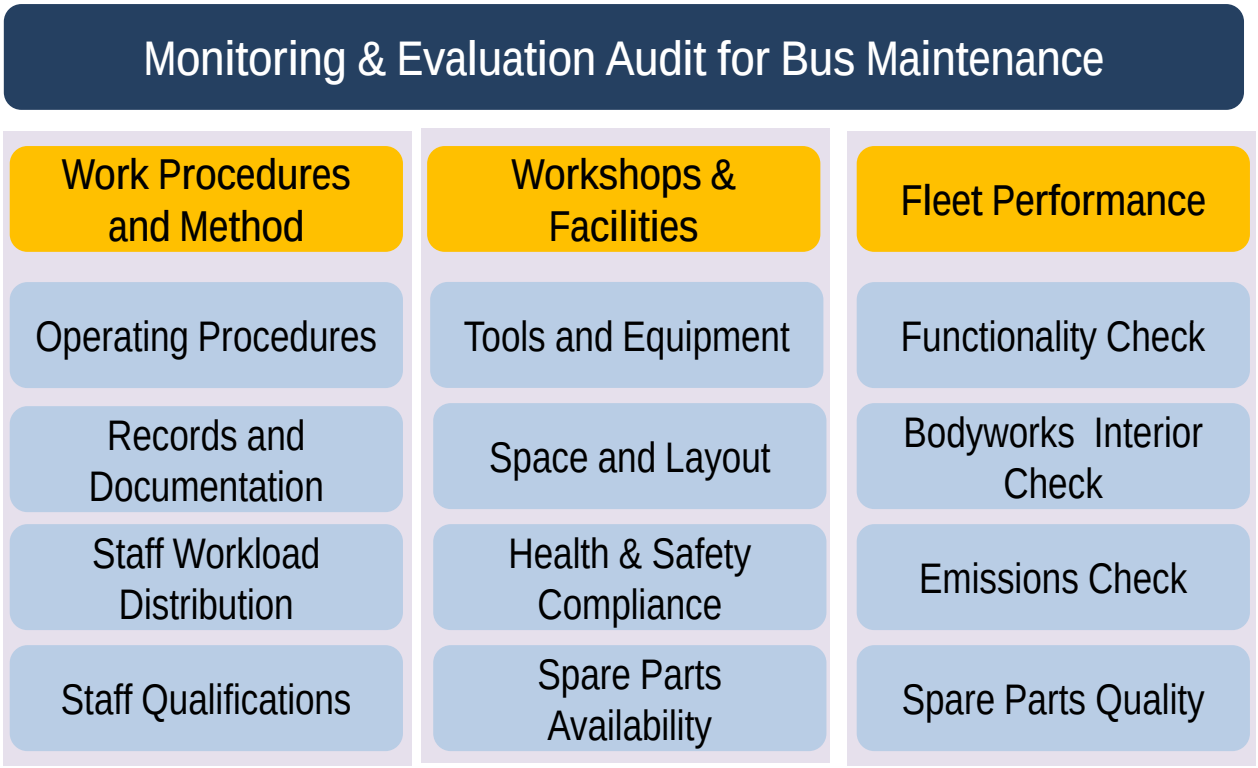


Figure 5.1: Items to be checked during Audit for Bus Maintenance

Monitoring and evaluation plays an important roles to ensure the quality of the bus in operation meets the minimum standard.

In general, monitoring should be performed by Transjakarta authority as part of their quality assurance for their passengers. For maintenance, it is important that thorough audit process on the following categories are conducted:

1. Work Procedures and Method
2. Workshops and Facilities
3. Fleet Performance

Figure 5.1 shows the items to be checked during the bus maintenance audit. While the period for checking varies between activities, it is recommended that audit for each of 3 categories above (shown in yellow box) are performed periodically every 6 months to ensure the quality of the bus performance.

To perform such audit, generally it would be relatively cheaper to do it in-house, by Transjakarta own staffs. However, this decision should be based on the availability on the skills, knowledge and availability of the staffs. If such skills do not exist, then hiring a third party independent auditor would be highly recommended.

Chapter 6
Fleet Recommendation

6. Fleet Recommendation

- To serve the “Direct” Service, a dual side entrance with different platform level fleet is required
- The recommended fleet to support such system has the length, width and height 10 meter, 2.4 meter and 3.5 meter respectively
- Whilst the availability of adequate supply of CNG is still far from ideal, nevertheless, introducing more CNG fleet into public transport in Jakarta could boosts investment in more refilling station across the city.
- However, since the efforts to put more CNG refilling stations are still underway, it is recommended that the decision to select CNG as fuel type should be only done under the adequate condition on the CNG supply availability, and the first phase of the project should be done using Diesel Engine.
- Maintenance Contract to ensure the quality of fleet performance throughout the service is important. Additionally, this measure should also be followed by a strict monitoring regime by Transjakarta