

### 23-1.1.13.3 Travel Speed Survey

In 3<sup>rd</sup> and 4<sup>th</sup>-Monitoring Survey, Travel Speed Survey was carried out for 2 directions as the same method of previous survey, north-south and east-west directions. The result is the following.

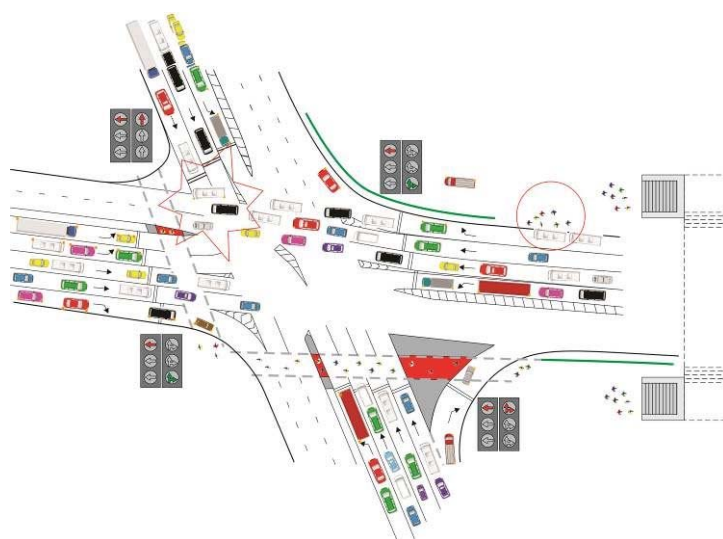
**Table A 23-1.1-13 Summary of Travel Speed Survey**

Unit: km/h

North-South Direction	Baseline	3 <sup>rd</sup> -Monitoring	4 <sup>th</sup> -Monitoring
Morning Time (7:00, 8:00, 9:00)	26.99	28.82	48.31
Daytime (11:00, 12:00, 13:00)	25.09	30.20	42.37
Evening (17:00, 18:00, 19:00)	22.45	34.13	42.56
East-West Direction	Baseline	3 <sup>rd</sup> -Monitoring	4 <sup>th</sup> -Monitoring
Morning Time (7:00, 8:00, 9:00)	26.80	25.47	23.47
Daytime (11:00, 12:00, 13:00)	24.04	26.40	24.96
Evening (17:00, 18:00, 19:00)	17.30	22.07	25.63

The average travel speed was improved at North-South Direction after the implementation of the Pilot Project in each time zone; morning, daytime and evening. Even if the traffic signal cycle is longer than previous cycle. The road users have aligned in a line by following the new road markings so the left-turning vehicles might not likely retard subsequent vehicles by the making separated lane.

3<sup>rd</sup> and 4<sup>th</sup>-Monitoring Survey results show little improvement in the result of Baseline Survey at west-east direction. It might be said that the traffic signal cycle is longer than previous cycle. In addition, the road users, especially, minibus and midibus drivers go through the right turn only lane from eastern approach to western approach, not to northern approach. The reason that the people ride and alight from these buses at the eastern approach, and they go straight from right turn-only lane. Therefore, there are sometimes congestions because the vehicles come from 3 lanes even there are 2 lanes from east side to west in the western approach.



**Figure A 23-1.1-46 Congestion of Western Approach**

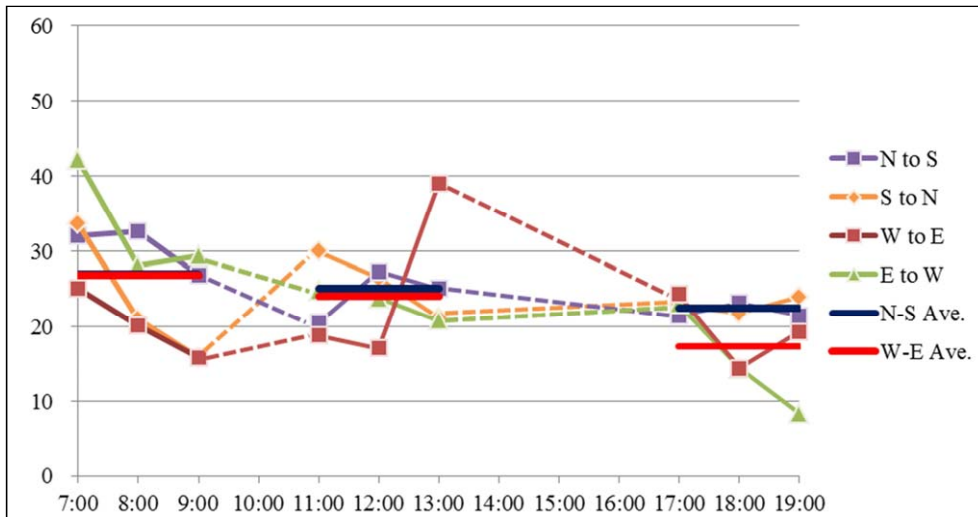


Figure A 23-1.1-47 Travel Speed Survey Baseline Survey

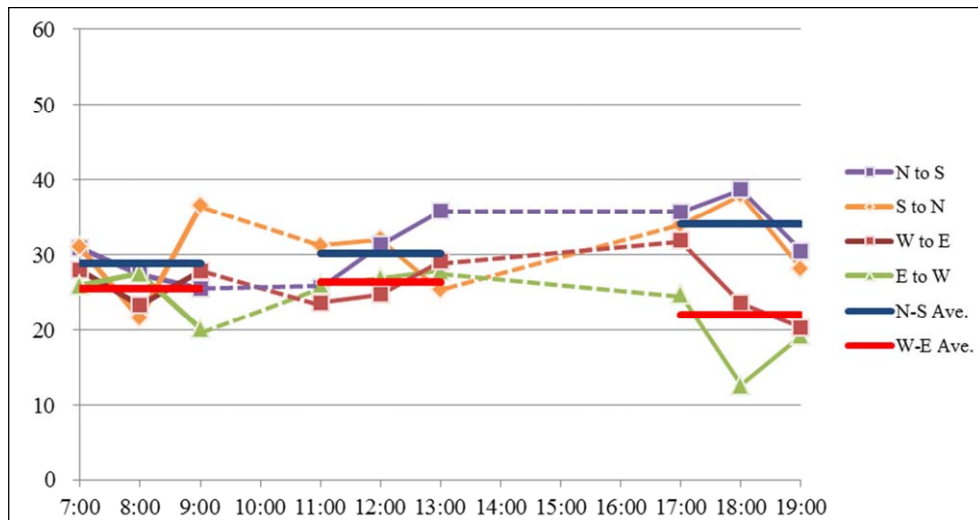


Figure A 23-1.1-48 Travel Speed Survey 3<sup>rd</sup>-Monitoring Survey

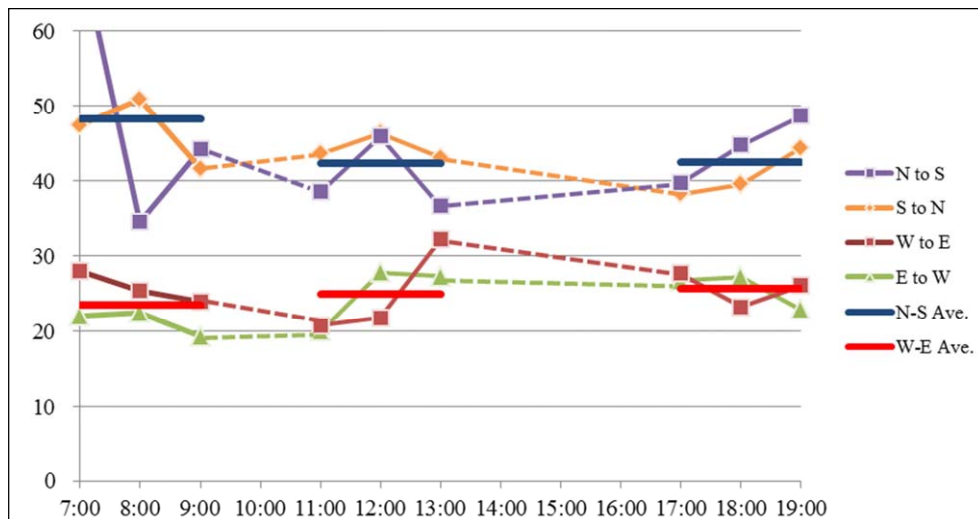


Figure A 23-1.1-49 Travel Speed Survey 4<sup>th</sup>-Monitoring Survey

### 23-1.1.13.4 Traffic Signal Cycle Survey

#### 4<sup>th</sup>-Monitoring Survey

The signal sequence has been changed to improve at IS-01 by Traffic Control System Improvement. Its total signal sequence time is longer than previous cycle. **Figure A 23-1.1-50** shows phase patterns and times.

Phase	$\phi 1$		$\phi 2$		$\phi 3$		$\phi 4$		$\phi 5$			
Schematics												
Survey by the JICA Study Team in March, 2013												
	1Phase (A)		2Phase				3Phase (B)		4Phase(C)		5Phase(C)	
	LT	ST&RT	(A)		(B)		LT	ST&RT	LT	ST&RT	LT	ST&RT
Green	5	11	-	15	-	21	35	35	12	-	-	24
Flashlight of Green	3	-	-	3	-	-	3	3	3	-	-	3
Amber	3	-	-	3	-	-	3	3	3	-	-	3
Red	-	-	23	2	23	2	2	2	2	20	32	2
Sum	11		23				43		20		32	
Total	129											

LT-Left Turn      ST&RT-Straight and Right Turn

**Figure A 23-1.1-50 Result of Traffic Signal Cycle at Chui-Fuchik Intersection**

### 23-1.1.13.5 Public Opinion Survey

The public opinion surveys were carried out on 15 November, 2012 and 28 March, 2013 at Chui-Fuchik Intersection. The respondents detail is shown in **Figure A 23-1.1-51** and the form is shown in **Figure A 23-1.1-52**.

The public opinion survey form was changed for the evaluation of pilot project. 95% of respondents answered the road marking, sidewalk, construction of traffic island, traffic signal system, bus stop and pedestrian underpass have been improved.

The summary of public opinion surveys are shown in **Table A 23-1.1-14**.

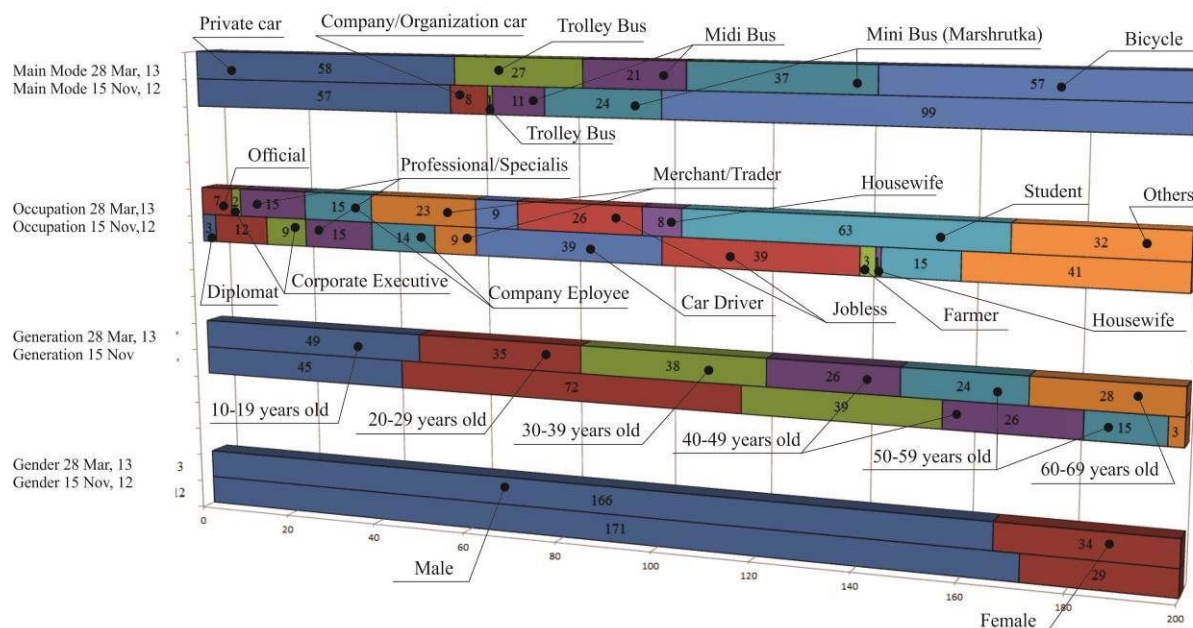


Figure A 23-1.1-51 Respondents Detail

Table A 23-1.1-14 Summary of Public Opinion

#	Improvement Items	3 <sup>rd</sup> -Monitoring Survey			4 <sup>th</sup> -Monitoring Survey		
		Yes	No	Others	Yes	No	Others
	<b>Chui-Fuchik improved by Pilot Project</b>	<b>194</b>	<b>6</b>	<b>0</b>	<b>196</b>	<b>4</b>	<b>0</b>
1	Road Marking	194	0	0	195	1	0
2	Sidewalk	192	2	0	195	1	0
3	Traffic Island	191	3	0	191	5	0
4	Traffic Signal System	193	1	0	195	1	0
5	Bus Stop	193	1	0	196	0	0
6	Pedestrian Underpass	179	15	0	188	8	0

### Public Opinion Interviews Form for Intersection

**The Study on Improvement of Urban Transportation in the Bishkek City of the Kyrgyz Republic  
BCDA / JICA - 2012  
OPINION INTERVIEW FORM**

Date : \_\_\_\_\_  
Location : \_\_\_\_\_

This is an interview to research the necessity and impact of junction improvement project, which will be carried out by BCDA in cooperation with JICA.

**If you don't mind, please describe yourself by following classifications, then proceed Q.0**

Gender: 1. Male  2. Female

Age 1. 10~19 Years Old  2. 20~29 Years Old  3. 30~39 Years Old   
4. 40~49 Years Old  5. 50~59 Years Old  6. 60~69 Years Old

Occupation: 1. Diplomat  2. Official  3. Corporate Executive  4. Professional / Specialist   
5. Company Employee  6. Merchant / Trader  7. Car Driver   
8. Jobless  9. Farmer  10. Housewife  11. Student  12. Others

Main Mode: 1. Private Car  2. Company/Organization Car  3. Trolley Bus   
4. Midi Bus  5. Mini Bus (Marshrutka)  6. Motorcycle   
7. Bicycle  8. Walk  9. Taxi

**Q.0 Do you think Chui-Fuchik Intersection has been improved by pilot project?**

1. Yes  
2. No

— If you select "1" in Q.0, Please proceed Q.1  
— If you select "2" in Q.0, Please proceed Q.2

➤ **Q.1 Please answer following questions about improvement works in the intersection under Jica Pilot Project.**

➤ **Q.1-1 Do you think that Road marking such as lane marking, stop line, or pedestrian line etc. have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.1-2 Do you think that side walk have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.1-3 Do you think that Traffic island construction for the pedestrians have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.1-4 Do you think that Traffic signal system (Including traffic signal for pedestrian) have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.1-5 Do you think that Bus stop which is located on east leg in the intersection have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.1-6 Do you think that Pedestrian underpass which is located on east leg in the intersection have been improved than before?**

1. Yes, I think so.  
2. No, I don't think so.  
3. Others (Please Specify) \_\_\_\_\_

➤ **Q.2 Which counter measures to be undertaken, beside above improvement plan?**

1. Improve a public parking space  
2. Provide much more public transport means (such as increase the line of Trolley, Midi or Mini Bus)  
3. Provide new bus stop in the intersection  
4. Others (Please Specify) \_\_\_\_\_

**That's All. Thank You Very Much for Your Cooperation.**

Figure A 23-1.1-52 Public Opinion Survey Form

## **23-1.2 Public Transportation Facilities Improvement**

### **23-1.2.1 Background**

During the first field survey and traffic counting survey conducted in the year 2011, it has been seen that the intersection is highly used by people in order to reach surrounding facilities such as Hospital, Osh Market, City Council and commercial industries. Public transport such as Mini Bus, Midi bus and Trolley buses, is highly used to reach those destinations. However, due to the poor pedestrian and public transport facility environment, public experience is very stressful and facing significant risks of danger.

Following shows some of issues identified, which are

- ✓ Pedestrian crossing infrastructure such as crossing points marking, and crossing lights are insufficiently provided. Therefore, pedestrian have to cross on their own initiative in a busy traffic flow.
- ✓ Pedestrian underpass is poorly maintained and lacks in the provision for personal safety, which leads to discourage pedestrian use.
- ✓ Public buses stop away from curb at bus stop as well as stops at unofficial bus stop, so passengers have to get off and on from road.

### **23-1.2.2 Objectives of Public Transportation Facilities Improvement**

Based on above background, further study has been conducted as Pilot Project to evaluate condition of public transport facility, aiming to improve public experience on the use of public transport through upgrading the public transport facility including pedestrian and bus user environments of the linkage from the bus stop to surrounding destination. Specifically;

- ✓ Divert existing unsafe at-grade pedestrian flow on Chui Avenue to the safe, secured and accessible pedestrian underpass and surrounding area
- ✓ Upgrade a bus stop and waiting area that improve access and experience of bus users as well as bus services.
- ✓ Through the above two improvement, feasibility of proposed design is determined and appropriate direction for further Public Transport development plan to be developed.

### **23-1.2.3 Selected Site**

Following three (4) Public transport facilities have been identified as focus of the pilot project for public transport facility improvement.

- ✓ Pedestrian Crossing and Sidewalk on Chui / Fuchik Intersection
- ✓ Pedestrian Underpass on Chui Avenue

✓ Bus stop and waiting area on Chui Avenue



Pedestrian crossing.



Side walk



South side Stairs to Pedestrian Underground



Pedestrian Underground



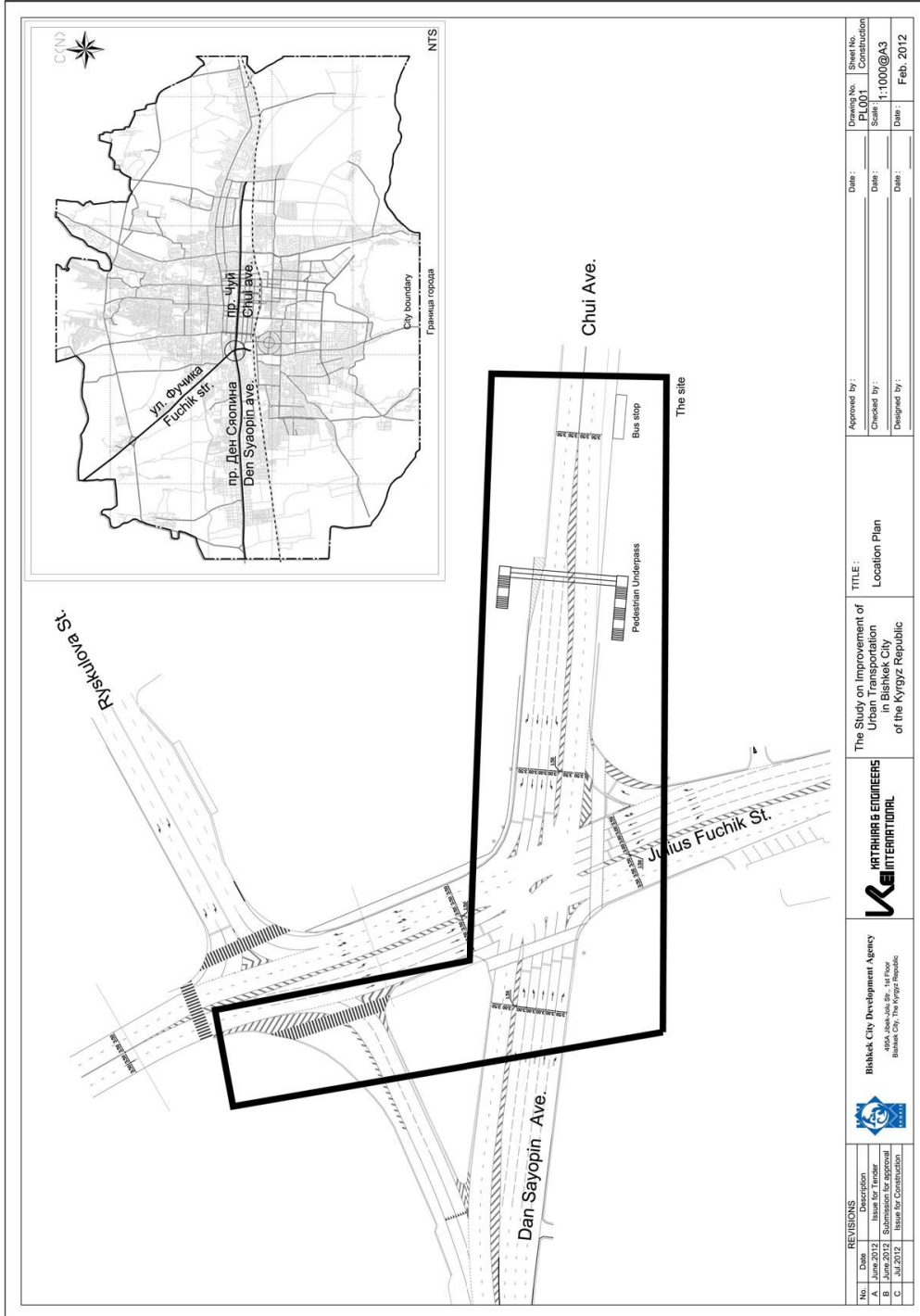
Bus stop



Bus stop

Source: JICA Study Team

**Picture A 23-1.2-1 Pilot Project Site for Public Transport Facility**



Source: JICA Study Team

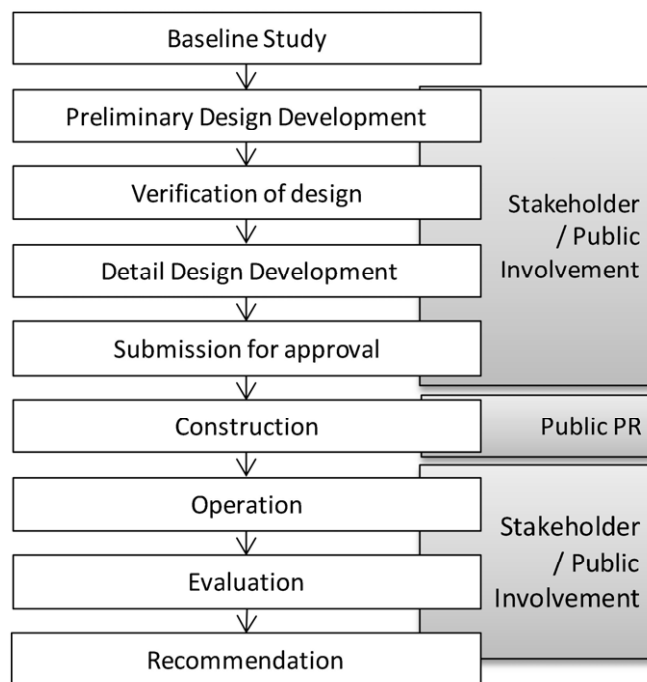
Figure A 23-1.2-1 Location Map of Pilot Project Site



**23-1.2.4 Methodology for Implementation of Pilot Project**

Through the pilot project, above 3 facilities have been studied further in detail and provided strategic opportunity to significantly improve access for pedestrian and passenger experience. Pilot project for public transport facility has been conducted in following methodology.

A Pilot Project process was employed in this Project as the one of means to involve public on the process of formulating development strategies. During development and implementation of Pilot project, stakeholders and public were closely involved at design development stage through consultation, public opinion surveys, on site trial and at operation stage through actual use of facility. To encourage wider participation of public to the pilot project, pilot project was also advertised through Bill Board etc.



Source: JICA Study Team

**Figure A 23-1.2-2 Work Flow**

**23-1.2.5 Implementation Schedule**

**Table A 8.2-1** shows the implementation schedule of the pilot project conducted.

**Table A 23-1.2-1 Implementation Schedule**

Activities	2012									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Baseline Surevey										
Base Designn development										
Detail Design Development										
Stakeholder Meeting										
Submission for approval										
Construction										
Operation										
Evaluation										

Source: JICA Study Team

### 23-1.2.6 Basic Principle for Public Transport Facility

#### 23-1.2.6.1 Public Transport Facility Planning and Design Policy

Public transport service does not end at Bus stop, it encompass the entire pedestrian and bus service capture area. Potential user have to reach to the bus stop with good experience, they will not use the service. Therefore public transport facility has to fulfill a complex variety of functions which requires meeting following two main aspects, which are;

**(1) Design for wider type of user**

Public transport facility has to address needs of bus operator, public bus users, pedestrian, utility providers, residents, etc. For bus users, Safety and Security, Accessibility and Connectivity, is essential components for their experience of using public transport. On the other hand, for bus operator Efficient, Effective and Economical are their main concerns for their maximum profit of their business.

**(2) Integration**

Public transport facility have to take consideration of three integration to 1) service operation, 2) other transport mode such as foot to buses, bicycle to buses, buses to buses, private vehicle to buses have to be take into account, and 3) the site and surrounding. Especially Public transport service generates activities which might be potentially negative to the site and surrounding area such as increase in transport volume, change of land use, exposure of residential area, etc. Public transport facility needs to provide mitigation measure to those impacts and consider integrating public transport activities to the site and surrounding.

#### 23-1.2.6.2 Technical Policy

Preparation of Design, Construction and Implementation plans were prepared by the JICA Study Team. Wherever applicable existing regulations, standard of the Republic of Kyrgyz have been applied to design and details. For new design and details introduced which regulation and standards are absent, have been consulted to appropriate authority and obtained approval prior to implementation.

Especially the areas where consideration of international standards such as provision for disabled people, building standards, has been also applied wherever accepted. Uses of technology, skills and materials have been employed local resources wherever possible.

Thus, technical transfer and skill to local authorities, engineers and consultant have been provided.

### **23-1.2.6.3 Management Policy**

During preparation and implementation of Pilot Project, the JICA Study Team consulted very closely with BCDA and the concerned agencies in the Republic of Kyrgyz and JICA for proper management and implementation of the pilot project.

### **23-1.2.7 Baseline Study**

#### **23-1.2.7.1 Review of Laws, Regulations, and Standards Related to Public Transport Facility**

Existing regulations, standard and guideline applied for Public Transport Facility, were investigated and found that the Republic of Kyrgyz applies mostly those of Russian which applied the time of under their control. Below are the lists of documents found during the study;

- ✓ Regulation for design and construction SP 35 - 101 - 2001
- ✓ Design of buildings and structures accessible for physically handicapped persons
- ✓ Guideline for design of underpass, serial # 3.507 - 1
- ✓ SNIP 11 - D.5 - 72 Road design
- ✓ VSN 103 - 74, Technical instructions for design of intersections and junctions
- ✓ GOST 218.1.002 - 2003, Bus stop - Technical Requirements
- ✓ SNIP 23 - 05 - 95, Natural and artificial lighting

However, during study it has been observe that above regulation have not fully enforced to implement. As a result, standards have been differed by each facility.

#### **23-1.2.7.2 Review of Authority and Responsibility Relevant to Public Transport Facility**

Relevant authorities for public transport facility were also identified and consulted through development of pilot project.

**Table A 23-1.2-2 Relevant Agencies for Public Transport Facility**

Agencies	Role and responsibility
Bishkek City Development Agency (BCDA)	
The Bishkek City Mayor's Office	Responsible for implementation of pilot project and maintenance and management of public transport facility
Department of Architecture	Approval of public work in Bishkek city
The Construction, Mounting & Operating Department of TSD of CDIA	
The Municipal Property Department	Responsible for Street furniture
Traffic Police	Responsible for Public safety
The City Transport Department	
The Road and Transport Supervision Department of TSD (CDIA)	
Bishkek City Urban Transport Department	
Bishkek Passenger Transport Enterprise	

Source : JICA Study Team

### 23-1.2.7.3 General Condition of Public Transport Facility

General condition of public transport facility in Bishkek city has been studied.

#### (1) Pedestrian underpass

There are 14 pedestrian underpasses in Bishkek City and two pedestrian underpasses have been visited during field survey. Both underpasses have been let out the space by Bishkek City to private retailers such as stationary shop, bakery, copier etc. with maintenance contract. It has been informed that this approach has been successful and attracts people to use underpass not only for crossing but also for visiting shops.

#### (2) Bus stop and waiting area

##### (a) Bus Stop

Bus Stop design has been developed based on Russian Specification of GOST as mentioned above, however due to road and surrounding development, condition has changed and the application of such standard is not visible any more.

##### (b) Bus waiting area

In general, most of bus stop has accompanied with Bus shelter with bench and litter bin. There are several design observed for public transport furniture but most of them are deteriorating due to the poor material and fabrication. Currently Bishkek City has been undergoing to replace old bus shelter into the new uniformed design, which contract out to the private companies as advertisement space. The new design have bench, litter bin and advertisement side panel integrated lighting.

It has been also information board showing bus number stopping at bus stop have used to be installed but not anymore.



Old type of Bus Shelter



New type Bus Shelter

Source : JICA Study Team

**Picture A 23-1.2-2 Old and New Bus Shelter**

#### 23-1.2.7.4 Basic Contents and Condition

Field survey was conducted to identify basic contents and condition of pilot project site.

##### (1) Road design

The road design of existing bus stop widens from bridge toward the junction. Road marking was applied in the year 2011, however, it has been disappearing. Below tables shows basic road data.

**Table A 23-1.2-3 Basic Data of Road**

ITEMS	AREA	DATA
Total width	at intersection	21 m
	in front of bus stop	17.5 m
No of lane	at intersection	(Heading West ) 4 lanes (Heading East ) 2 lane
	in front of bus stop	(Heading West ) 2 lanes (Heading East ) 2 lane
Width of lane	at intersection	(Heading West ) 3 m x 3 lanes and 3.5 m right turn lane (Heading East ) 3.5 m x 2 lanes
	in front of bus stop	(Heading West ) 3.5 m x 2 lanes (Heading East ) 3.5 m and 10 m

Source : JICA Study Team

##### (2) Pedestrian Underpass

Following shows basic data of pedestrian underpass and entrance area. Stairs are leading to one direction only. Due to installed concrete tunnel ring, the tunnel is not straight and also lowered to North. No maintenance or management has been provided, for some time, therefore the facility is deteriorating significantly.

**Table A 23-1.2-4 Basic Data of Pedestrian Underpass**

AREA	ITEMS	DATA
Entrance area	Retaining wall	250 mm and 700 mm height at North and South entrance respectively
	Other amenities	Signage at both entrances
Steps	Step no	North side : two parts of 22 steps and 10 steps which one is formed within the tunnel South side : 32 steps
	Step rises and going	Varies
	Other amenities	Handrail (one side of south staircase only)
Tunnel	Size	length: 44 m width : 2.9 m ceiling height : 2.25 m
	Material	concrete ground surface “Sarytash” stone clad wall.
	Other facility	2 un-used working spaces Drainage pit at both side end of tunnel Lighting

Source : JICA Study Team

**(3) Bus stop and waiting area**

Bus stop is defined by allocated bus shelter, and there is no other sign or facility to signify the bus stop. Bus stop shelter has been newly installed early 2012.

**Table A 23-1.2-5 Basic Data of Bus Stop**

AREA	ITEMS	DATA
Bus lane	Width	6.5 m
	Other amenities	N/A
Bus stopping zone	Design	Straight along sidewalk
	Length	No definite area
	Other amenities	N/A
Waiting area	Height	0.3 m
	Width of side walk	5.5 m
	Width of waiting area	2.7 m (Bus shelter 2 m wide)
	Width of pedestrian	1 unit of 2.3 m
	Bus shelter	2 x 7 m, Integrated bench, litter bin and lighting with advert
	Other Furniture	1 no litter bin, Public phone ( out of order), street lighting, Kiosk

Source : JICA Study Team

**(4) Pedestrian Linkage**

The area is close proximity to city council, Osh market, restaurant, supermarket, hospitals. Pedestrian Route have been examine and found that Below shows the alternative route of area by Bus users to get to Bus stop A to Bus Stop B.

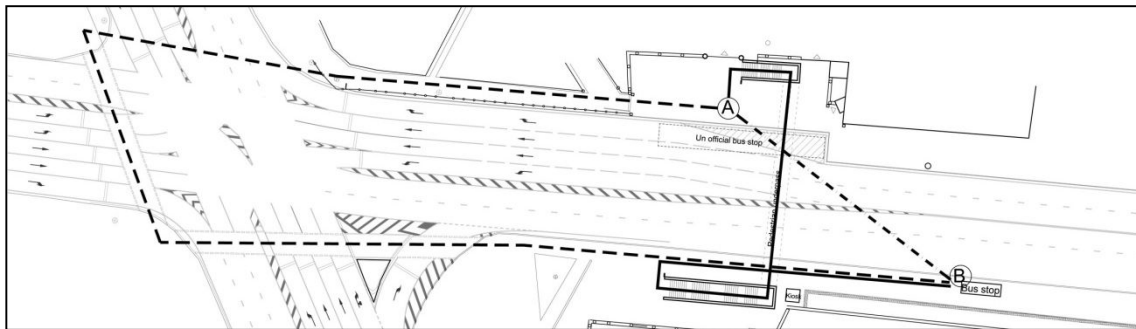
**(a) Bus Stops**

Buses heading to East, including Mini bus, Midi bus and Trolley bus, stops around the Bus stop provided in wider area. More buses tend to stop closer to intersection. Bus Users walk up to sidewalk or walk to get on buses.

Buses heading to West stop unofficially around in front of restaurant where space formed due to road tapering toward intersection.

(b) Pedestrian Route

For pedestrian there are 3 alternative route to get from A to B Bus stop as shown on below. Route 1 shows ground level route using pedestrian crossing, Route 2 shows using Pedestrian Underpass, and Route 3 is to cross road straightly. Following shows distance pedestrian have to take at each options.



**Figure A 23-1.2-3 Pedestrian route**

**Table A 23-1.2-6 Pedestrian Underpass Data**

	Route	Distance
Route 1	Using pedestrian crossing	296 m
Route 2	Using Pedestrian underpass	132 m
Route 3	Using Road crossing	47 m

Source : JICA Study Team

(5) Other Conditions

The area is open and exposed and especially in winter, all surface including sidewalk, stairs, bus stop is covered by snow. Furthermore, drainage at south side is not in good condition, which might be causes of leaking water to pedestrian underpass.

**23-1.2.7.5 Site Analysis**

The information gathered in the site analysis was analyzed in relation to the following three qualities .The Table shows the items which have been examined during the study.

(a) Integration to Wider Context

Public transport facility is to integrate into the site and surrounding areas including existing land use and future development plan.

(b) User's Quality of Experience:

Quality of experience using Public Transport Facility is a fundamental factor to influence users.

(c) Design elements:

Design elements are the list of physical factors makes up public transport facility. It is always design elements which will be tasked to bring unity and balance from above competing wider context and design principles, as well as require constant maintenance and improvement to meet changing needs and deterioration.

**Table A 23-1.2-7 Evaluated Items**

Category	Items
Integration to Wide Context	Public realm, Road design, Building environments, Cultural / Historical environments, Natural environments, Transport/Pedestrian Flow, Policy / regulation, Opportunities, Management and Maintenance etc.
Quality of Experience	Safety, Security, Accessibility & Connectivity, Legibility, Aesthetics
Design Elements	Pedestrian Surface, Curb/ Edging treatment, Stairs / Ramps, Railing / Balustrade, Retaining wall, Drainage, Boundary treatment / active edge, Focal point, Lighting, Signage, way findings, Utility Infrastructure access, Mobility inclusive (Universal Design), Soft landscape, Public Art

Source : JICA Study Team

(1) Integration to wider context

- ✓ Poor linkage and connectivity between north to south Chui Avenue
- ✓ Bus stop is under the capacity of number of users and buses.
- ✓ Bus stop creating traffic jam to traffic flow behind
- ✓ Lack of assistance to understand the area such as way findings, signage and signs.
- ✓ No provision for mobility impaired
- ✓ Absence of maintenance and management provision for public transport facilities.
- ✓ Lack of utilizing space

(2) Quality of Experience

(a) Pedestrian underpass and entrance area

(i) Entrance area

- ✓ Unsafe to Pedestrian; Parking for restaurant and illegal parking disturbs pedestrian access and putting pedestrian to the risk of collision to vehicles.
- ✓ Not legible to the Entrance to pedestrian underpass; Entrance is set back from road especially for North side, and not visible due to visually cluttered with many utility, material used and illegal parking.

(ii) Pedestrian underpass



- ✓ Unpleasant; deterioration of facility, dark, unhygienic, and odor.
  - ✓ In secure; Lack of surveillance such as presence of people, not permeable.
  - ✓ Not accessible for mobility impaired
- (b) Bus stop and waiting area
- ✓ Not accessible due to too high bus stop platform for Mini bus and Midi bus, which lead to bus user to step down to road to board buses.
  - ✓ No security from severe weather.
  - ✓ Surface is uneven, trip hazard by remaining of furniture and utility poles and missing paving.
  - ✓ No segregation of bus type
- (3) Design Elements
- ✓ Good characteristic by use of natural material such as “ Sarytash “ wall and granite block for steps and coping
  - ✓ Poor quality and design of street furniture
  - ✓ No information on time table nor bus route
  - ✓ Lack of devices to control traffic movement such as Bollard, Guard rail, Pavement, Crossing etc.



### 23-1.2.8 Preliminary Design Development

Based on the baseline survey and analysis conducted, JICA Study Team has developed preliminary design for upgrading of Public Transport Facility.

Among many improvements to be made for improvement of existing public transport facility, below points have been focused to achieve through improvement of bus design and Pedestrian Underpass in this pilot project to meet the objective of study,

- ✓ Improve Public experience using Bus Stop
- ✓ Improve Pedestrian access and linkage to Bus stop
- ✓ Improve Public Safety and Security

#### 23-1.2.8.1 Bus Stop Design

##### (1) Alternatives

In order to improve efficiency and good access for bus user, three alternatives have been developed for bus stop, which are Option 1: Full-width boarder, and Option 2: 1 m Half-width boarder, and Option 3: 0.5 m Half-width boarder. Height of Bus Boarder was kept to existing 300 mm to coordinate to Trolley bus floor height.

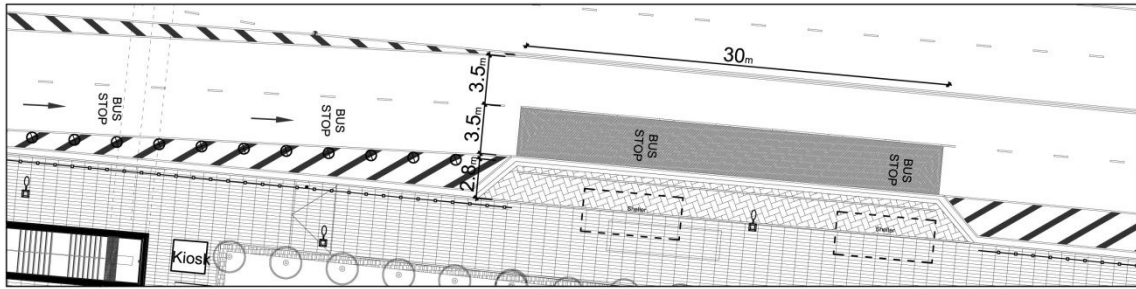
“Bus Boarder” design, is to extend a boarder toward road side to avoid bus maneuvering. In general Full-width boarder extends 2-2.5 m, and Half-width boarder extends 500 mm to full width boarder, which commonly 1.0 - 1.5 m. Length of Half-width boarder will require longer than Full-width boarder due to requirement of maneuvering.

Benefit of installing Bus boarder is considered as follows;

- ✓ Minimized the curb side space
- ✓ Deters illegal parking
- ✓ Maintain the place of the bus in the traffic stream
- ✓ Allow the bus to line up parallel to the curb, largely without maneuvers
- ✓ Reduce boarding / alighting time
- ✓ Reduce overall time spent at the bus stop
- ✓ Create additional footway space for passengers to wait

##### (a) Option 1: Full- width boarder with 3.5 m bus lane

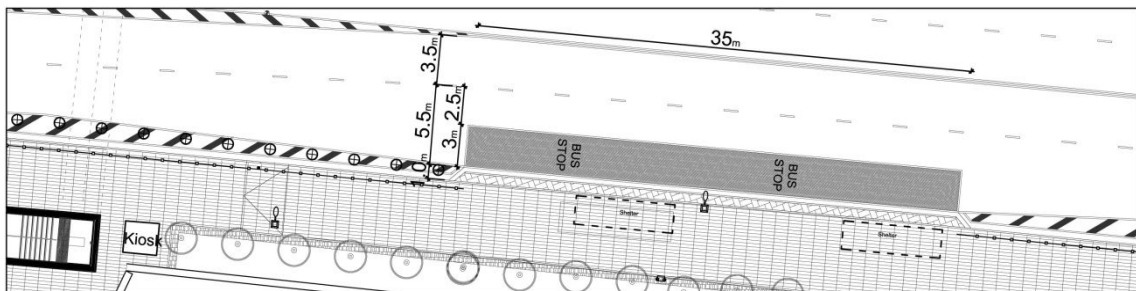
The Option 1 proposed to extend 2.8 m of bus boarder. One lane will be secured for running lane and second lane in front of bus boarder will be secured as Bus Priority zone.



**Figure A 23-1.2-5 Full - width Boarder (Option 1)**

- (b) Option 2: Half-width border (1 m) with 3 m width Bus lane

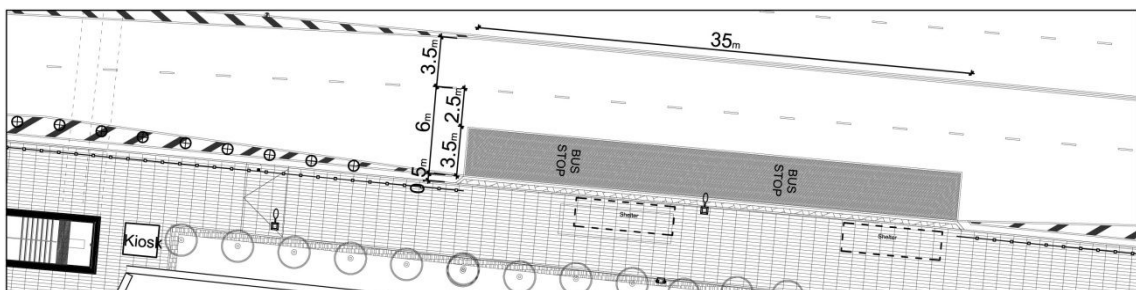
The Option 2 shows Half-width boarder (1 m). One lane will be secure for running lane and the second lane will be half secured as 3 m wide Bus Priority Lane which allows other buses and cars to take over parked buses, without disturbing running lane.



**Figure A 23-1.2-6 1 m Half - width Boarder (Option 2)**

- (c) Option 3: Half-width boarder (0.5 m) with 3.5 m bus lane

The Option 3 shows Half-width boarder (0.5 m). One lane will be secure for running lane and the second lane will be half secured as 3.5 m wide Bus Priority Lane which allows other buses and cars to take over parked buses. Length of Bus boarder will require longer than Full-width boarder.



**Figure A 23-1.2-7 0.5 m Half - width Boarder (Option 3)**

**(2) Comparison of Alternatives**

Following table shows comparison of each options and weighed its strength and weakness from 5 to 1.

From above analysis, it is concluded that the Full width bus boarder (Option 1) is the most appropriate option to be installed for this pilot project with other improvement activities.

**Table A 23-1.2-8 Comparison of Bus Boarder Options**

		Option 1	Option 2	Option 3
		Full width boarder	Half-width boarder	Half-width boarder
Extended build out at bus stop		2.8 m	1.0 m	0.5 m
Bus Cage width ( Bus Priority Zone)		3.5 m	3.0 m	3.5 m
Space available for overtaking		0.0 m	2.5 m	2.5 m
Bus stop length		30.0 m	35.0 m	35.0 m
Width of sidewalk		7.8 m	6.0 m	5.5 m
Bus operation improvement	Maintain buses in the traffic stream	5	3	1
	Vehicle to takeover buses at bus stop	1	3	5
	Bus to stop parallel to curb line without maneuvers	5	3	1
	Reduction of boarding/alighting time	5	4	3
	Reduction of overall time spent at the bus stop	5	3	3
Space Required	Reduction of curb side length for bus stop	5	3	3
	Additional waiting area for passenger	5	3	1
	Additional pedestrian footpath	5	3	1
Bus Passenger environment	Minimization of conflict between people and buses	5	3	3
	Minimization of conflict between bus passenger and pedestrian	5	3	3

\*Weight Scale: 1= Very poor; 2= Poor; 3= Fair; 4= Good; 5= Excellent  
Source : JICA Study Team

### (3) Public Interview Survey for Public Transport Facility

#### (a) Outline of survey

Public interview survey was conducted on 7<sup>th</sup> and 8<sup>th</sup> June 2012 by the subcontracted local consultant in order to reflect public opinion to the improvement of bus stop design. The survey was targeted Bus Passenger and Driver (Mini bus, Midi bus, Trolley bus) using the Bus stop of Pilot project site, on Chui-Fuchik Intersection, and total of 700 samples were collected.

#### (b) Main findings

##### (i) Bus Passengers

According to the result, it showed that 65.8 % of passengers answered that existing bus stop is easy to boarding and alighting while 31.4% found difficult. And the factors influencing the experience are whether 1) buses stop beside the bus bay and 2) coordination of bus bay height and bus floor height. For the proposed installation of Bus Boarder, 76.9% considers it would improve boarding and alighting to the buses.

##### (ii) Bus Drivers

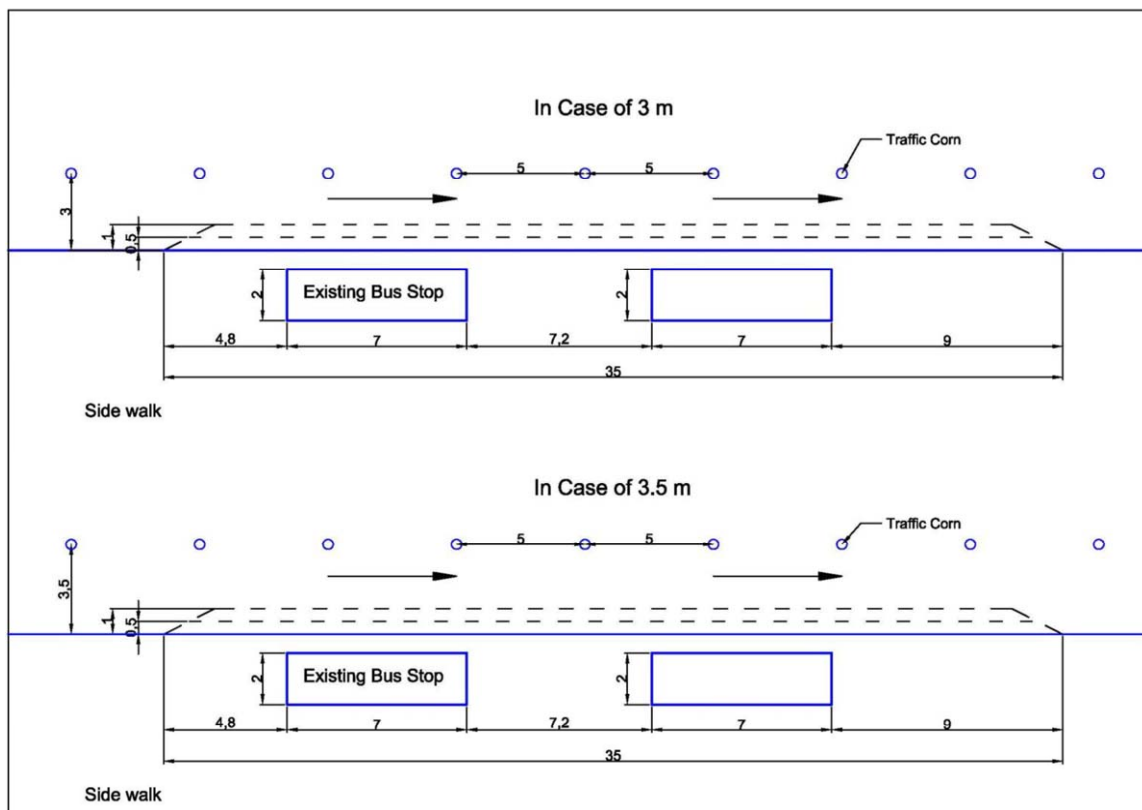
The result shows that the reason for not stopping close to bus stop are mainly due to 1) bus stop

occupied by others 47.6% and 2) efficiency of bus operation (23.0 %). As solution for stopping by bus bay, 35% answered that segregation of bus stops by types, 28% showed extension of bus bay length. For the proposed installation of Bus Boarder, 71.6% showed that it will help to stop buses close to curb line.

**(4) On site Trial for Bus lane width**

**(a) Outline of survey**

For the determination of appropriate bus lane width of 3 m or 3.5 m, on site trial was conducted on 7<sup>th</sup> and 8<sup>th</sup> June 2012 at the bus stop using traffic cones. The survey conducted to investigate how close each type of bus ( Mini Bus, Midi Bus and Trolley Bus) stopped to the curb line according to the width of bus lane of 3 m and 3.5 m. In total 528 no of buses were counted on the first day survey of 3 m width, and 466 buses were counted on the Second day survey of 3.5 m width.



Source : JICA Study team

**Figure A 23-1.2-8 Proposed on Site Trial**

**(b) Main findings**

Results showed that in 3 m width bus lane 35% stopped less than 1 m closer bus curb, whereas in 3.5 m width was 29% . For all type of buses 3 m width lane allowed buses to stop closer to bus curb. This result is also in line with the fact found narrower bus stop cage encourage bus drives to stop closer to the curb (Accessible bus stop design guidance, 2006, TfL).

**Table A 23-1.2-9 Result of Onsite Trial**

Width of bus lane	Mini Bus					Midi Bus					Trolley Bus					Total				
	total No.	Distance stoped (m)				total No.	Distance stoped (m)				total No.	Distance stoped (m)				total No.	Distance stoped (m)			
		0.5	1	>1.0	out		0.5	1	>1.0	out		0.5	1	>1.0	out		0.5	1	>1.0	out
3m	359	25	65	180	89	124	21	48	55	0	45	6	21	18	0	<b>528</b>	<b>52</b>	<b>134</b>	<b>253</b>	<b>89</b>
	100%	7%	18%	50%	25%	100%	17%	39%	44%	0%	100%	13%	47%	40%	0%	<b>100%</b>	<b>10%</b>	<b>25%</b>	<b>48%</b>	<b>17%</b>
3.5m	320	16	43	191	70	102	28	28	44	2	44	9	11	24	0	<b>466</b>	<b>53</b>	<b>82</b>	<b>259</b>	<b>72</b>
	100%	5%	13%	60%	22%	100%	27%	27%	43%	2%	100%	20%	25%	55%	0%	<b>100%</b>	<b>11%</b>	<b>18%</b>	<b>56%</b>	<b>15%</b>

Source : JICA Study team

### 23-1.2.9 Stakeholder Consultation and Approval

Through the design development of Pilot Project, JICA Study team has also consulted and coordinates closely with BCDA as well as Stakeholders and finalized design.

#### 23-1.2.9.1 Decision Making Process

In February 2012, preliminary design proposal for Pilot Project for Public Transport Facility was prepared based on baseline survey and submitted to BCDA. Proposal was further developed through survey, cost estimate and discussion with BCDA, and presented to working group on 5<sup>th</sup> June 2012. On 13<sup>th</sup> June 2012, during the second consultation, result of public interview and on site trial has been presented and consensus was built on bus stop design among working groups.

- ✓ Bus boarder extension- 0.5 meter.
- ✓ Length of Bus: 35 meters.
- ✓ Bus cage - 3 meters. Color - red with yellow zigzag. (with Traffic Police permission)
- ✓ No Bus stop flag and post to be installed.

On 14<sup>th</sup> June 2012, JICA study team has consulted with the Head of Bishkek City Main Department of Architecture on proposal and received advice on the provision of security for Pedestrian underground and further improvement, as well as Bus shelter design. He has concluded that installation of new bus shelter next to the existing bus shelter is not acceptable.

Following the meeting with Bishkek City Main Department of Architecture, BCDA consulted to the concessioner of bus shelter and agreed to take over the site and install proposed bus shelter by pilot project at the bus stop.

Following table shows consultation hold for decision making process. Besides a number of consultation and discussion were hold between JICA Study Team and BCDA.

**Table A 23-1.2-10 Consultation Hold for Pilot Project**

<b>Date</b>	<b>Attended parties</b>	<b>Objectives of meeting</b>
1 <sup>st</sup> Feb 2012	Architecture of Kyrgyz SSR Department	Information gathering
5 <sup>th</sup> June 2012	BCDA Bishkek Main Architecture Bishkek Trolleybus Department Bishkek Passenger Transport Department Public State Department of Capital Construction Public Transport Department Traffic Police	Presentation of Pilot project activities
13 <sup>th</sup> June 2012	Urban Transport Department Urban Transport Department Bishkek City Main Department of Architecture Bishkek Passenger Transport Enterprise Bishkek Passenger Transport Enterprise BCDA	Consultation to bus boarder
14 <sup>th</sup> June 2012	Bishkek City Main Department of Architecture	Consultation to ramp and bus shelter, and others

Source : JICA Study Team

### **23-1.2.9.2 Approval by Authority**

Reflecting the above series of consultations onto design, the proposal for pilot project was finally approved on 28<sup>th</sup> of June 2012 by the Bishkek City Main Department of Architecture.

### **23-1.2.10 Basic Design**

The section describes the final Basic Design implemented in Pilot Project. **Figure A 23-1.2-9** to **Figure A 23-1.2-12** shows proposed sitewide design, bus stop, bus shelter and pedestrian underpass.

#### **23-1.2.10.1 Pedestrian Crossing and Sidewalk**

Please see “**Appendix 23-1.1.5 (7) Pedestrian Movement**”.

#### **23-1.2.10.2 Improvement of Pedestrian Underpass**

##### **(1) Pedestrian underpass entrance area**

Improvement of the entrance area is crucial for increase public use of pedestrian underpass.

- ✓ Filling of void behind north entrance
- ✓ Reinforcement of coping
- ✓ Remove of potential trip hazard such as uneven surface, unfilled holes or remains of utilities



- ✓ Cleaning and Replace of broken gullies

(2) Steps to Pedestrian Underpass

Accessibility is one of issues for existing pedestrian underpass.

- ✓ Remove potential trip and slip hazard surface
- ✓ Provide handrails
- ✓ Introduce hazard warning surface at the top and bottom of steps

(3) Pedestrian Underpass

The narrow long pedestrian underpass (44 m long, 2.9 m wide and 2.25 m high) required significant improvements to brighten up the space and provide surveillance to attract people to use.

- ✓ Resurface of underpass with cross fall and gradient
- ✓ Installation of Drainage channel
- ✓ Adjustment of drainage cover level
- ✓ Restoration of “Sarytash retaining wall cladding and ceiling
- ✓ Repaint of ceiling
- ✓ Replacing doors and frame
- ✓ Installation of CCTV camera and speaker

### 23-1.2.10.3 Bus Stop

(1) Installation of bus boarder and bus cage

The height of bus boarder was maintained as 300mm which was coordinated to Trolley buses.

- ✓ Installation of 0.5 m wide Bus boarder
- ✓ Installation of 3 m wide Bus cage with red surface paint and yellow zig-zag line
- ✓ curb coloring

(2) Improvement of bus waiting area

Bus waiting area amenities were arranged carefully so that sufficient space for wheelchair users and pedestrian are secured. Installation of bus boarder has contributed to widen available spaces for bus waiting area. For new bus shelter transparent material was employed to increase permeability of the area. Information board was also provided on the side panel where timetable and route map can be provided. Color of Bishkek City has been applied to the bush shelter.

- ✓ Resurfaced and Remove of potential trip hazard

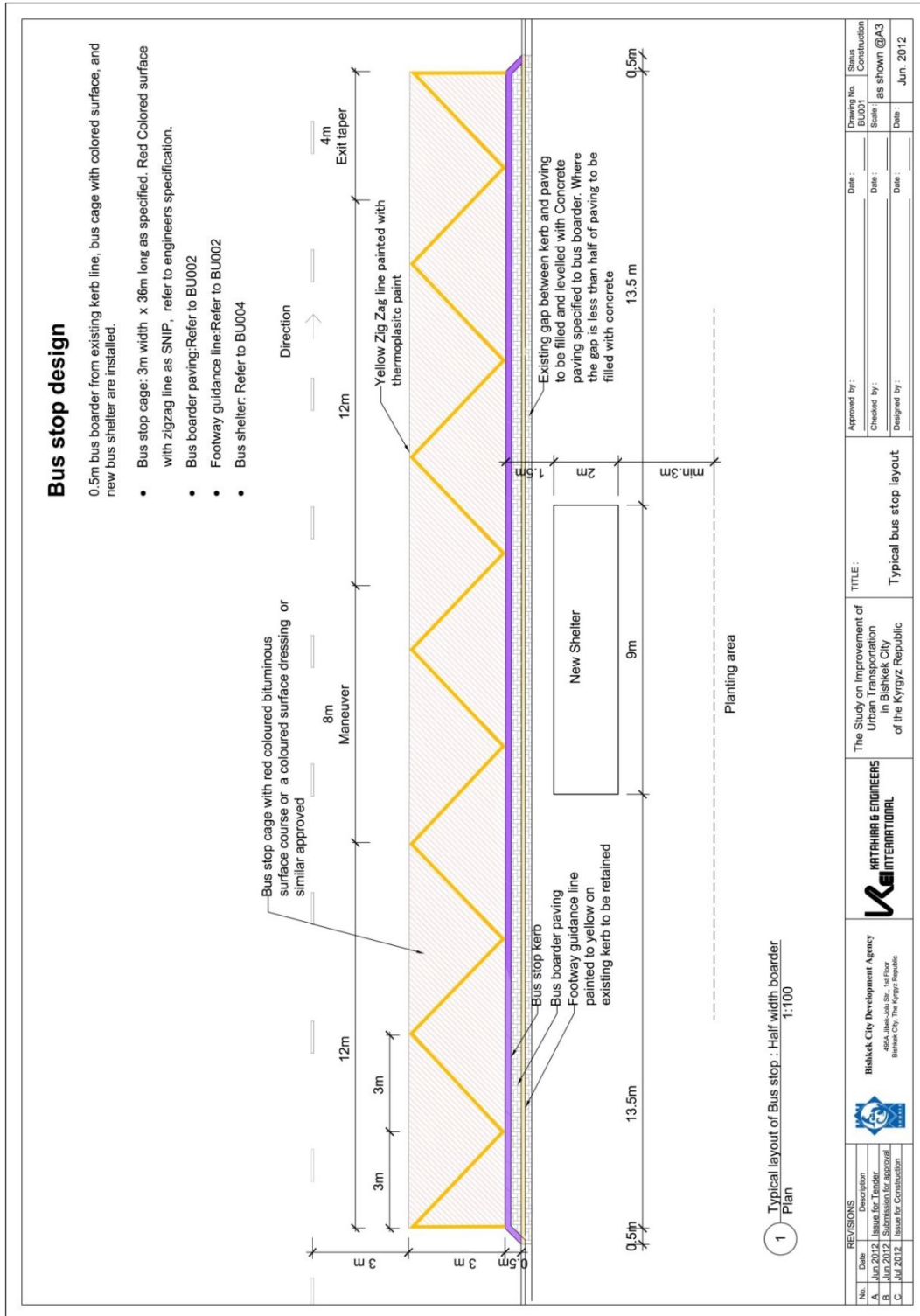
- ✓ introduced with new bus shelter
- ✓ A footway guidance line

**Table A 23-1.2-11 Bus Stop Design**

Area	Items	Data
Bus Boarder	Width	0.5 m
	Length	36 m
	Height	0.3 m
	Other amenity	curb coloring in black and white
Bus stopping zone	Design	Straight along sidewalk
	Wide	3 m
	Length	36 m
	Other amenities	Surface is painted in Red and Yellow zig-zag line on top.
Waiting area	Height	0.3 m
	Width of side walk	5.5 m
	Width of waiting area	1.5 m
	Width of pedestrian	3 m
	Bus shelter	2 x 9 m
	Other Furniture	1 no litter bin, bench, lighting and information board

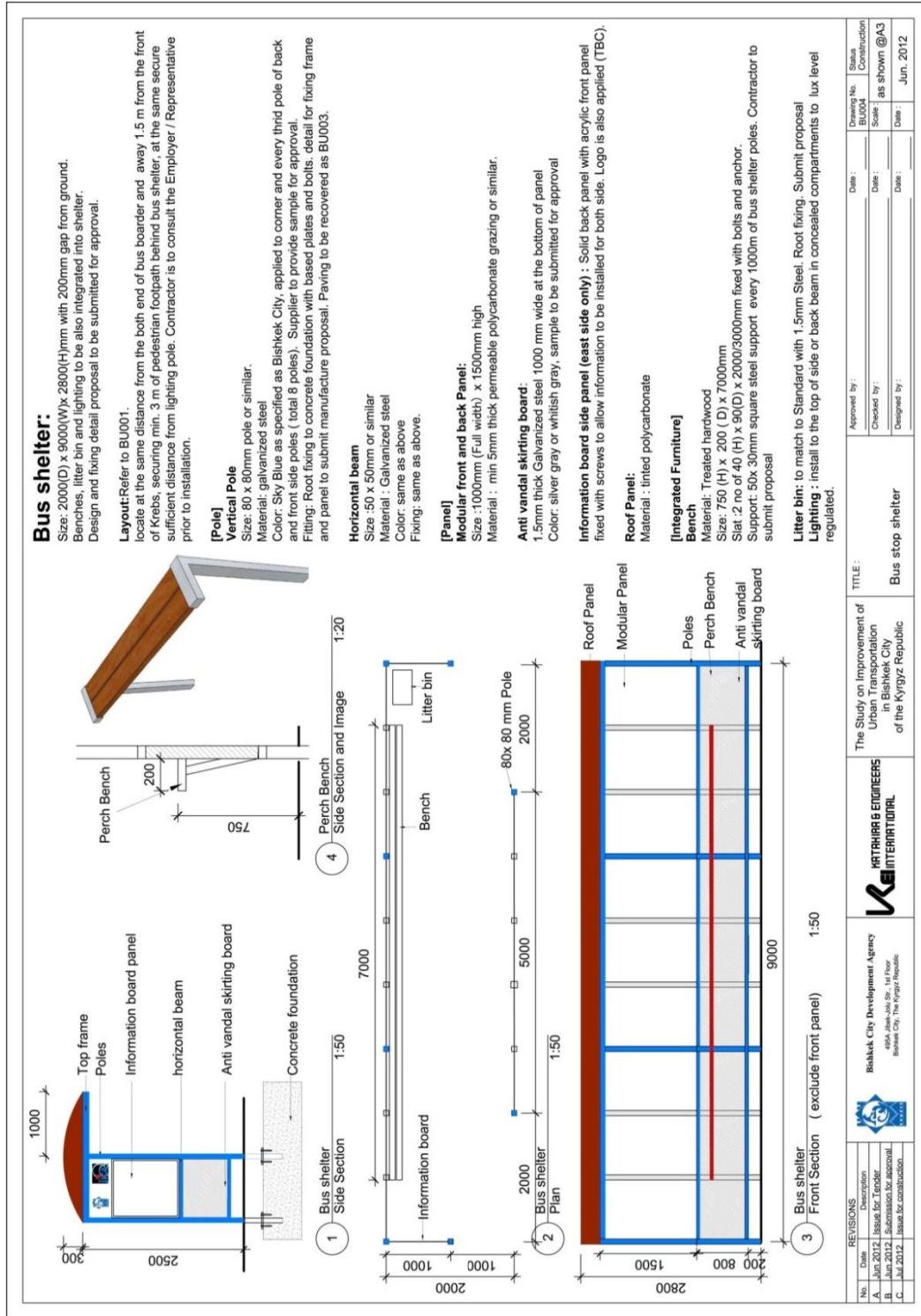
Source : JICA Study Team





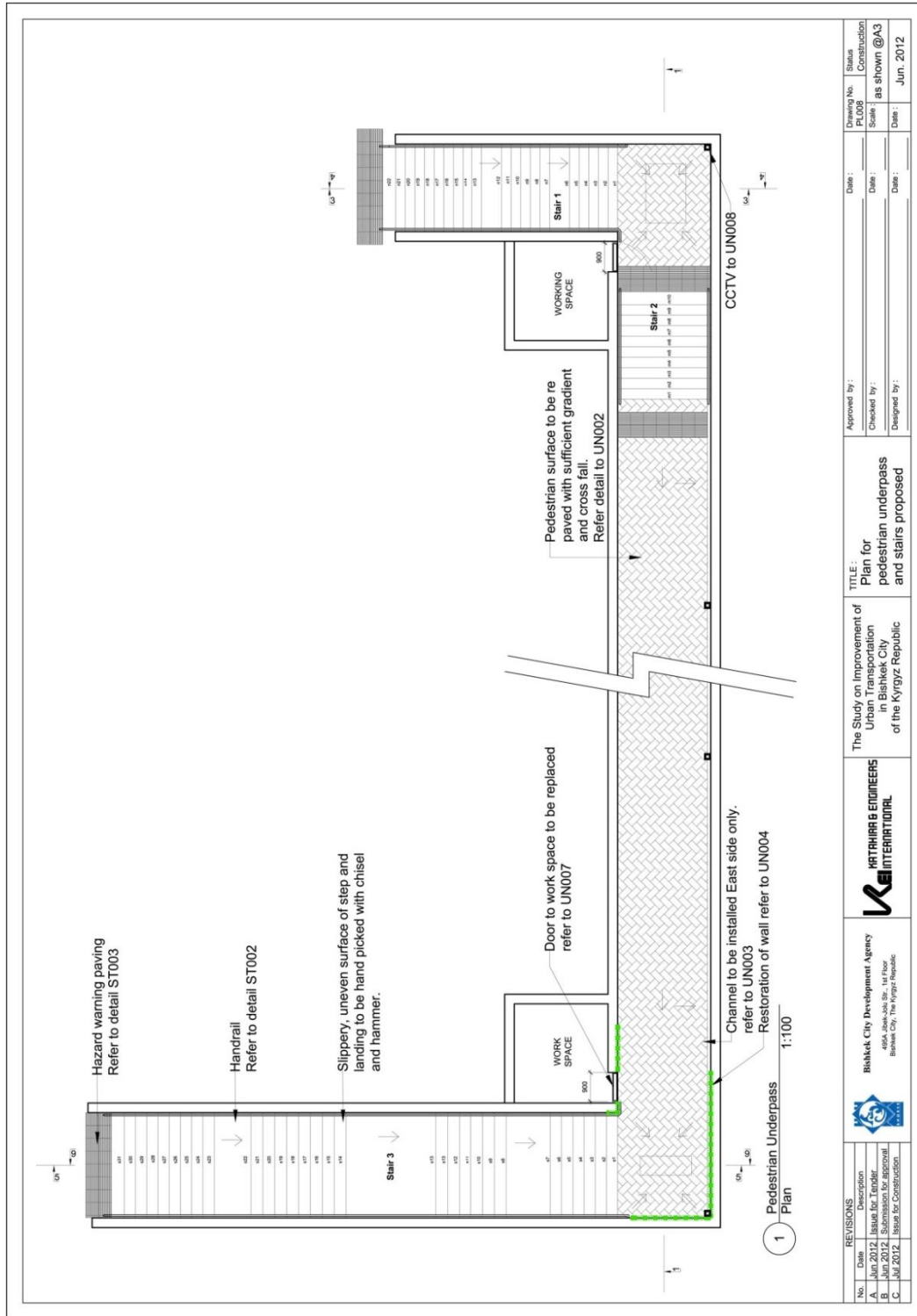
Source : JICA Study team

Figure A 23-1.2-10 Proposed Bus Stop Design



Source : JICA Study team

Figure A 23-1.2-11 Proposed Pedestrian Underpass



Source : JICA Study team

Figure A 23-1.2-12 Proposed Pedestrian Underpass

### **23-1.2.11 Implementation**

#### **23-1.2.11.1 Implementation Framework**

**(1) Tender**

Contractor was selected through tender process and formed a contract in 2<sup>nd</sup> July 2012.

**(2) Construction**

Construction works scheduled to last for two and half months commencing from 5<sup>th</sup> of July 2012 and completing by 20<sup>th</sup> September 2012. Construction has been implemented in following 6 phases.

Phase 1: Pedestrian underpass and entrance area

Phase 2: Sidewalk

Phase 3: Bus stop and waiting area

Phase 4: Traffic island

Phase 5: Traffic Signal

Phase 6: Road marking

**(3) Site Management**

Prior to the construction work, official letter was issue to relevant bodies such as bus operators, transport police etc., to announce the commencement of proposed work. Especially during the work on road, traffic management has been requested to Traffic Police. Constructor have been also contracted to provide sufficient health and safety comprised of Local regulation to their employee and public during works.

JICA experts and engineers have been conducting on site management and report the progress to BCDA.

**(4) Handover**

Due to the construction process taking phases, the site has been open to the public in phases after the inspection by the JICA Experts and BCDA. The site was handover to the Bishkek City after the final inspection of entire site has been conducted and cleared all rectification lists.

#### **23-1.2.11.2 Construction Schedule**

Construction schedule is shown in **Table A 23-1.2-12** and each area has opened to public on days showed in **Table A 23-1.2-13** with approval of BCDA. The entire pilot project site has handed over to the Bishkek City on 20<sup>th</sup> September 2012 as planed schedule.

**Table A 23-1.2-12 Construction Schedule**

Construction works	July				August					September			
	week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9	week 10	week 11	week 12	week 13
CONTRACT													
Procurement & mobilization	██████████	██████████	██████████										
Pedestrian Undergroundpass		██████████	██████████	██████████									
Side Walk				██████████	██████████	██████████	██████████	██████████					
Bus Stop				██████████	██████████	██████████	██████████	██████████					
Traffic Island						██████████	██████████	██████████	██████████				
Road Marking									██████████	██████████	██████████		
Traffic signal				██████████	██████████	██████████	██████████	██████████	██████████				
Final inspection											██████████	██████████	██████████
Completion													██████████

**23-1.2.11.3 Maintenance and Management Framework**

By the time of handover, the official letter was also exchanged to delegate responsibility of role and responsibility of public facility installed. Main responsibility for operation, management and maintenance of upgraded Public Transport Facility has been delegated to the Bishkek City. Specifically Operation, Maintenance and Management of CCTV are delegated to Lenin district Office.

**23-1.2.12 Evaluation of Pilot Project**

As described in “Appendix 23-1.1.13.5 Public Opinion Survey “, users evaluated public transportation facilities positively.

**23-1.2.13 Issues and Findings**

Followings are issues and findings identified through Pilot Project on Public Transport Facility.

**(1) Location**

Public transport facility of pedestrian crossing, pedestrian underpass and Bus stop has been located without consideration for convenience of pedestrian, pedestrian flow. Consideration for locating pedestrian crossing and Bus stop at North side of Chui Avenue to control pedestrian movement and secure public safety, alternatively provide sufficient means to deter these activities required such as installation of Pedestrian Guardrail and regulation.

**(2) Segregation of Bus Stops**

Installed bus boarder does not have bus flat and pole, due to regulation for only one Bus post and Flag available to one Bus stop. Due to the volume and several types of buses using the one bus stop, use of bus boarder in controlled manner is crucial to avoid disturbance in bus zone area, as well as assist passengers to find their buses and minimize walk distances. Installation of Bus flag and stop according to type of buses or



destination will sort existing chaos and also allow further considerations to the gap between bus stop and vehicle floor height.

**(3) Enforcement**

Proposed improvement also requires various enforcement on use of the area. Buses to be prioritized in provided Bus cage zone, and illegal parking in the area including on pedestrian pavement around the entrance of Pedestrian Underpass have to be controlled.

**(4) Driver Training**

While bus stop have been upgraded, it is equally important that buses are driven in a manner that fully utilizes the facilities offered. Extensive guidance and practical training have to be implemented to all drivers.

**(5) Maintenance**

Provision of maintenance is crucial for public transport facility to provide its optimal proposed function for bus service and public experience.

Local authority and delegated authority has responsibility for maintenance of bus top area and underpass. This includes cleaning, maintenance of facility, and footway and carriageway surface, and winter maintenance in the vicinity of the area.

During regular routine maintenance and periodical maintenance, any damage and defects of facility have to be repaired and potential risks such as trip and slip hazard, water pond have to be removed.

#### **23-1.2.14 Recommendation**

From above evaluation and issues found through implementation of pilot project, following recommendation are drawn for public transport facility improvement.

**(1) Develop Public Transport Facility Development Strategy as a Package**

As mentioned in the above, although new bus boarder and bus shelter have been installed, it will be difficult to achieve its optimum effects due to its correlated facility such as bus stop flag, pedestrian crossing, bus driver training etc. Therefore, it is curtail to develop public transport facility as a package, in conjunction with soft aspects as well as policy and regulation.

**(2) Upgrade Pedestrian Environment and Network**

Pedestrian network have to identified and improve its connectivity and environment, which will be well supported by public transport.

**(3) Regulate Mobility Inclusive design**

Public facility including pedestrian, public transport facility and open spaces should be applied mobility inclusive design of international standard.

**(4) Prepare Guidelines**

As the Russian standard is not any more applicable and public transport facility has been developed by site to site. Preparation of standard / Guideline for Public transport Facility, Pedestrian environment, mobility impaired are urgently required.

**(5) Integration of Public transport Facility development into master plan**

Public transport facility development will bring a huge impact to the site and surrounding. It should be integrated to the transport master plan and land use development plan of the City, as well as developed in harmony with relevant strategy, development plan.

### **23-1.3 Traffic Control System Improvement**

#### **23-1.3.1 Background and Objective**

Chui-Fuchik is one of the biggest and “busiest” intersection in Bishkek (total area is about 2800 sqm). Average traffic flow density through the Chui-Fuchik is 5,000 vehicles per hour. Vehicular traffic is regulated by the local controller made in Soviet Time (in 70’s), which causes difficulties while driving through the intersection and traffic jams occurrence. Also Intergel’po-Dan Syaopina intersection traffic signal operation has influence with traffic flow through the Chui-Fuchik intersection. Intergel’po-Dan Syaopina intersection is situated about 330 meter to the west from Chui-Fuchik.

In order to improve the situation at the intersection, Japanese experts have executed pre-monitoring survey which included: traffic count, signal circle survey, traffic queue measurements and public opinion interview regarding the situation at the intersection.

Basing on the survey data it was decided to implement the Pilot Project on Traffic System Improvement on Chui-Fuchik and Intergel’po-Dan Syaopina intersections, synchronizing its’ operation in order to provide smooth traffic flow.

#### **23-1.3.2 Objectives of Study**

Based on above background, further study has been conducted as Pilot Project to evaluate condition of traffic system, aiming to improve traffic flow at Chui-Fuchik Intersection through installing local controller, inductive loop vehicle detector and changing phase sequence etc. Specifically;

- ✓ Set up the suitable phase sequence pattern and time in order to improve traffic flow
- ✓ Mitigate the traffic congestion for peak hour
- ✓ Reduce the traffic pollution by the less time of traveling and decreasing the number of stopping of vehicle

#### **23-1.3.3 Selected Site**

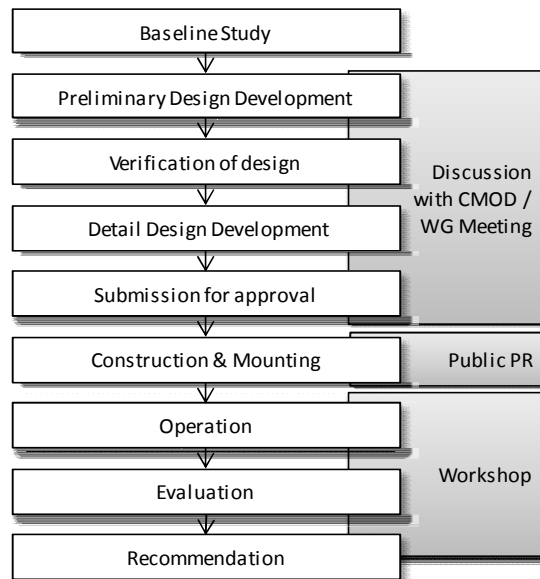
According to the discussion with first vice mayor in the 1st year, the JICA Study Team and the Bishkek City have agreed that the pilot project intersection is Chui-Fuchik regarding Public Transport Facility and Traffic Control System Improvement. Therefore, Traffic Control System Improvement was carried out at Chui-Fuchik Intersection.

#### **23-1.3.4 Methodology for Implementation of Pilot Project**

Currently, all traffic signals and pedestrian signals are controlled under Construction Mounting Department of Domestic Affairs (CMOD). The JICA Study Team had a lot of meeting to discuss the

process and how to improve the traffic system at Chui-Fuchik Intersection with this organization.

Finally, the JICA Study held 5<sup>th</sup> WG meeting and CMOD has agreed on the improvement plan. Pilot project for traffic system improvement has been conducted in following methodology.



Source : JICA Study Team

**Figure A 23-1.3-1 Work Flow**

### 23-1.3.5 Implementation Schedule

Table A 23-1.3-1 shows the implementation schedule of the pilot project conducted.

**Table A 23-1.3-1 Implementation Schedule**

Activities	1st Year					2nd Year								
	2011		2012											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
Baseline Surevey	█													
Base Designn development						█	█							
Detail Design Development								█	█					
WG Meeting							█		█					
Submission for approval									█					
Procurement										█	█	█		
Construction											█	█	█	█
Operation														█
Evaluation														█

Source : JICA Study Team

### 23-1.3.6 Baseline Survey and Analysis

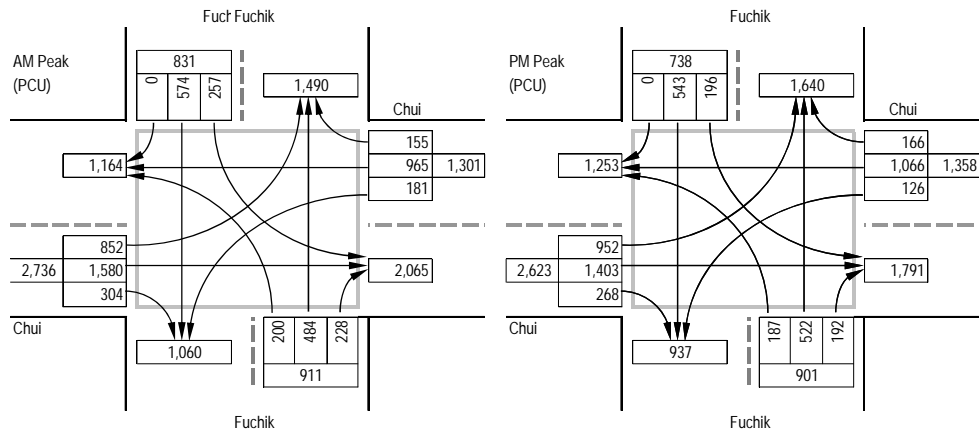
#### 23-1.3.6.1 Current Traffic Condition

Intersection directional traffic count survey was conducted to understand the current traffic volume at the intersection. The count data in vehicle was first converted to passenger car unit, which represents traffic count of specific vehicle type into traffic count in passenger car unit. The conversion is necessary as one large vehicle is equivalent to more than one passenger car in the signal control. The passenger car unit adopted is shown below.

**Table A 23-1.3-2 Passenger Car Unit (PCU)**

Class	1.	2.	3.	4.	5.	6.
Type	Sedan, Pickup / Van	Mini Bus	Midi Bus	Trolley Bus / Large Bus	Light Truck	Heavy Truck
PCU	1.0	1.5	2.0	3.0	2.0	3.0

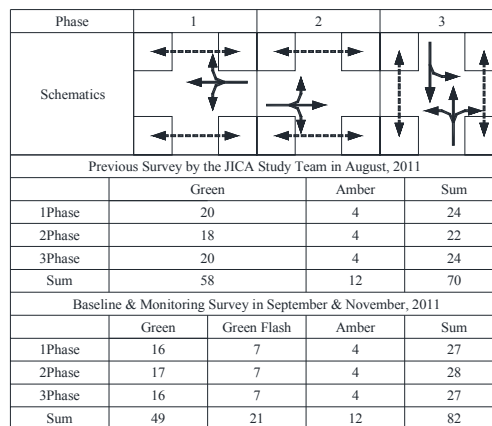
Traffic count data in Passenger Car Unit (PCU) is reviewed and peak hour was identified. Peak hour is defined as one hour starting from 0 minute, during which the total intersection traffic volume in PCU is highest in AM or PM period. Peak hour was identified separately for AM and PM as traffic pattern is normally different in AM and PM. The peak hour traffic in AM and PM at Chui – Fuchik intersection is schematically shown below. As the traffic count survey was conducted for five times in 2011 at this intersection, the average of peak hour traffic volume at each survey was used as intersection average peak hour traffic.



**Figure A 23-1.3-2 Peak Hour Traffic Volume (PCU)**

**23-1.3.6.2 Current Phase Sequence**

Baseline and monitoring surveys in 2011 were carried out by the JICA Study Team. According to those surveys, the signal phase sequence before the pilot project was as shown below.



**Figure A 23-1.3-3 Traffic Signal Cycle**