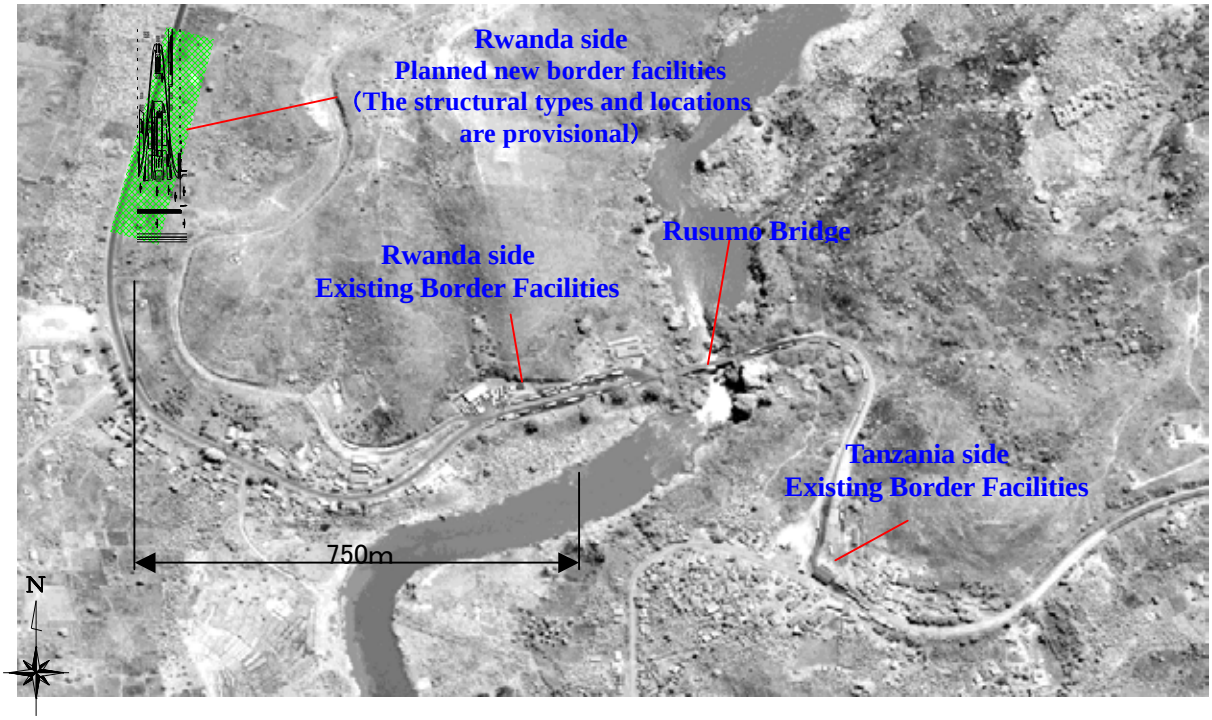


Fig. 2-1 Aerial Photograph of Rusumo Bridge and the Border Area

2-2 Outline Design of the Requested Japanese Assistance

2-2-1 Design policy

2-2-1-1 Basic Policies

At the first JTC meeting during the First Field Survey period, it was confirmed that the request for the Project consisted of the following two components.

- Reconstruction of Rusumo Bridge and construction of roads serving the border facilities
- Construction of OSBP facilities and provision of equipment for the OSBP facilities

In relation to the proposed new Rusumo Bridge, a suitable location was examined along with the issue of what to do with the existing bridge. In regard to service roads, it was confirmed at the second JTC meeting that the construction of a new road would be necessary and that the new border facilities would have to be fenced off to clearly mark the site from the outside area if the new border facilities on the Rwanda side were located some 750 m towards Kigali from the present site.

Meanwhile, the OSBP facilities can be classified into two types, i.e. a single facility in one country and juxtaposed facilities. At the Rusumo border point, the border is on the centre line of (A)kagera River and at the halfway point of Rusumo Bridge on the road. It is, therefore, physically impossible to introduce new OSBP facilities on the actual border. Moreover, it is extremely difficult to secure flat land of the necessary size on either bank of (A)kagera River to accommodate OSBP facilities to function as a single facility in one country because of the local topographical conditions.

This situation has led to the judgement that the introduction of a single facility in one country will be extremely difficult. As both countries have accepted the juxtaposed facility open which is physically feasible, it has been decided to plan the Rusumo OSBP facilities as juxtaposed facilities. It has also been decided to locate the new OSBP facilities on the Rwandan side some 750 m away from the present site towards Kigali. The reasons for this are (i) given the small area of the present border facility site, large-scale cutting work would be required to secure a sufficient area to accommodate the new facilities at the present site and (ii) the locationing of the new facilities at a new site is more advantageous to eliminate the traffic congestion involving large vehicles at the existing border facility site. In contrast, the new OSBP facilities on the Tanzanian side will be located at the extended present site as no other suitable site capable of accommodating the new facilities can be found in the vicinity.

In regard to equipment for the OSBP facilities, proposals for the necessary equipment were made at the second and third JTC meetings and the list was finalised at these meetings. Because the Project is the first project to construct OSBP facilities with Japanese grant aid, the draft optimal plan featuring the design policies, scale and style of the facilities and other relevant matters was basically formulated by the Consultant in consideration of economy, safety of the work and traffic safety after the opening of the new facilities. These matters were then finalised through consultations at the JTC meetings held during the field survey periods.

Fig. 2-2 shows images of the new Rusumo Bridge, OSBP facilities and bypass road.

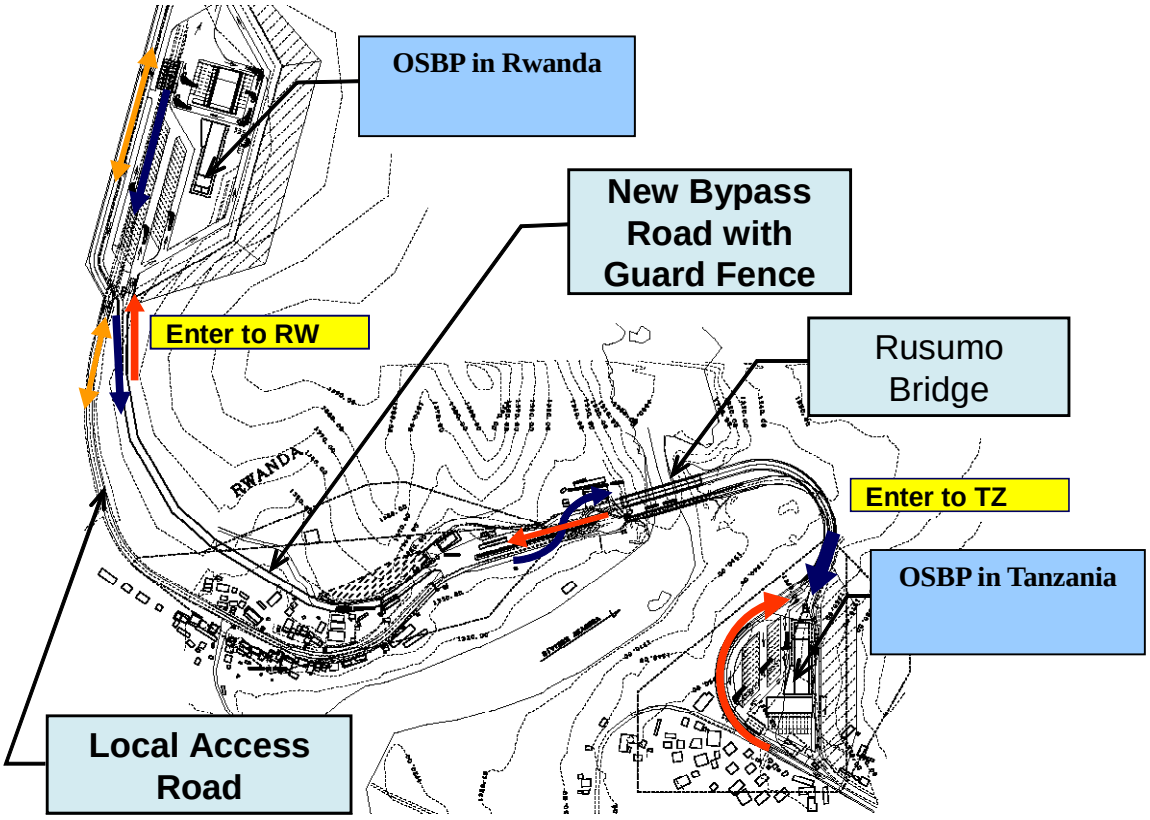


Fig. 2-2 Images of New Rusumo Bridge, OSBP Facilities and Bypass Road

2-2-1-2 Natural Conditions

(1) Hydrological and Aseismic Analysis

As already described in Chapter 1, hydrological analysis for Rusumo Bridge was conducted with reference to the survey data for the Rusumo Dam Project. The high water level and other relevant matters have been determined based on the examination of such data in view of the conditions at the proposed new Rusumo Bridge river crossing point. The aseismic analysis for the new Rusumo Bridge similarly referred to the relevant principles adopted for the Rusumo Dam Project for this type of analysis and the seismic load was determined using data on past earthquakes.

(2) Implications of Dry and Rainy Seasons on the Construction Work

The available rainfall data for the Rusumo Bridge site indicates that there are two periods of high rainfall in the year. Accordingly, the two month period of April and May and the three month period of October through December are considered to be the rainy periods for the purpose of the Project. However, the temporary suspension of the construction work during these rainy periods is judged to be unnecessary as the mean monthly rainfall during these periods is approximately 140 mm.

(3) Consideration of Temperature During the Construction Period

The mean monthly temperature in the Rusumo area is fairly steady throughout the year with maximum and minimum mean monthly temperatures of approximately 30°C and 14°C respectively. The establishment of a system to lower the temperature of the concrete at the time of concrete placement is, therefore, judged to be unnecessary.

2-2-1-3 Policies Regarding the Socioeconomic Conditions

(1) Basic Data for the Two Countries

Both Rwanda and Tanzania are members of the EAC. Table 2-1 shows the national land area, population, GDP and GDP per capita of the two countries

Table 2-1 Basic Data for the Two Countries

	Area ('000 km^2)	Population (million)	GDP (US$ million)	GDP per Capita (US$)
Tanzania	945	40	48,921	1,255
Rwanda	27	10	8,444	898

Source: JICA, Report for the Preparatory Study for Cooperation to Facilitate Physical Distribution in the Tanzania-Rwanda Border Region, Including Rusumo Bridge Site, 2009

(2) Outline of the Socioeconomic Conditions

Rwanda is a landlocked country with the highest population density in Africa. It has hardly any valuable natural resources and the main export goods are coffee and tea. It is an agricultural country and some 90% of the total population rely on agriculture for their lives. Although the domestic

economy was devastated by the civil war in 1994, the macroeconomic indices have improved in recent years to maintain steady growth, partly because of massive assistance by the international community.

In Tanzania, agriculture accounts for 80% of the working population and 45% of the GDP. Agricultural products, such as coffee, cotton, flowers, cashew nuts, tobacco and tea, account for a large proportion of Tanzania's exports. The annual GDP growth rate was as high as 7.1% in 2008, illustrating the country's steady economic growth.

(3) Tax Exemption

The Rwandan side agreed to take necessary measures for exemption of all kinds of tax and duties for the Project.

The Tanzanian side agreed to exempt all taxes and duties for the project in accordance with provisions contained in the E/N (Exchange of Notes) and G/A (Grant Agreement) of the Project..

(4) Security Situation

The security around Rusumo Bridge and the border facilities is believed to be reasonable as there is a local police presence in view of the fact that the area is an international border area.

2-2-1-4 Policies Regarding the Local Construction Industry and Local Procurement

（1） Local Construction Companies and Labour Conditions

In Tanzania, there is a compulsory registration system for private sector construction companies. These companies are classified in seven classes (1 to 7) based on such indices as the annual turnover and asset value of the construction machinery in possession. Companies in the two top tiers (Class 1 and Class 2) have sufficient manpower and machinery to act as subcontractors for the Japanese Contractor for the Project.

In Rwanda, there are several local and foreign-owned private construction companies which can act as subcontractors for the Japanese Contractor for the Project.

Workers for the Project can be provided by these companies in both countries. However, the recruitment and dispatch of some specialists from Japan and/or third countries will be necessary. These include a general manager, bridge engineer and skilled workers in some fields due to the local scarcity of such personnel with sufficient technical expertise.

（2） Procurement of Materials and Equipment

1） Procurement of Materials

In both countries, materials which can be procured locally include crushed stone and aggregates for road paving as well as concrete preparation, cement, timber, plywood, bricks and squared logs. It is, therefore, safe to say that the basic construction materials can be locally procured. In addition, imported reinforcing bars, fuel, asphalt and some construction materials (roofing materials, flooring

materials, window glass and others) are available in the local market. However, import from Japan or a third country will be necessary for steel, bridge steel and some finished products.

2) Procurement of Construction Machinery

Although some private sector construction companies in the two countries possess road construction machinery and plant (to produce crushed stone, concrete and asphalt), the number of such machinery/plant is quite limited, making its timely procurement/leasing for the Project difficult. Hardly any companies have special machinery, such as large cranes. There is no construction machinery leasing company in either Rwanda or Tanzania and companies which possess construction machinery arrange the leasing of such machinery between themselves.

3) Transportation (Maritime and Land)

There are two feasible routes for the inland transportation of the goods procured in Japan or a third country from the port of landing to the Rusumo site. One is the Northern Corridor starting in Kenya (Port of Mombassa) and the other is the Central Corridor starting in Tanzania (Port of Dar es Salaam).

- Port of Mombassa → Kenyan roads → Ugandan roads → Rwandan roads → Rusumo site (involving three countries)
- Port of Dar es Salaam → Tanzanian roads → Rusumo site (involving only one country)

(3) Other (Power Supply, Water Supply and Telecommunications)

1) It is planned to extend a transmission line to the project area by 2012. In view of the possible lack of a power supply line, the use of a generator is considered.

2) Water for the construction work can be supplied by the water supply system run by the local village authority. Drinking water must be bought in bottles.

3) In regard to communication, mobile phones using the network of a private provider can be used for domestic and international calls.

2-2-1-5 Policies Regarding Operation and Maintenance

On the Rwandan side, while the new bridge and OSBP facilities after their completion will be owned by the Ministry of Infrastructure (MININFRA), their actual operation and maintenance will be the responsibility of the bodies using them. To be more precise, the Rwanda Transport Development Agency (RTDA) will be responsible for the new Rusumo Bridge and the Rwanda Revenue Authority (RWA) will be responsible for the OSBP facilities.

In Tanzania, the Ministry of Infrastructure Development (MOID) will assume overall responsibility for the Project while the Tanzania National Roads Agency (TANROADS) will be

responsible for the construction and maintenance of the new Rusumo Bridge. The responsible agency for the construction of the OSBP facilities will be the Tanzania Building Agency (TBA). The responsibility of the operation and maintenance of the OSBP facilities will fall on the Tanzania Revenue Authority (TRA) which will actually use these facilities.

Both countries have been struggling with the maintenance needs of the existing Rusumo Bridge and are aware of the fact that the service life of the bridge has been shortened by failure to repaint this steel arch bridge at the right time. In view of this, both countries are hoping to adopt a type of bridge which requires minimum maintenance and the use of atmospheric corrosion-resistant steel for the new bridge is, therefore, considered.

The use of locally procurable equipment, etc. as much as possible for the new OSBP facilities has also been decided in view of the ease of the replacement of parts, etc. in the future.

2-2-1-6 Policies Regarding the Facility and Equipment Grades

(1) Rusumo Bridge

In regard to use of the existing bridge, some members of the JTC from both countries have expressed a wish that the bridge will be left outside the scope of the new facilities and that these countries will be made responsible for any future use of the bridge, including the option to dismantle it. The Japanese side have accepted this wish and decided not to plan for the future use of the existing bridge under the Project. Instead, the introduction of a footpath, which will also function as a maintenance passageway, on both sides of the new bridge is now planned. For the design live load of the new bridge, it was decided at a JTC meeting that the Type B live load in Japan's Guidelines for Road Bridge Construction will be compared to the NA + 45 NB load of the SADC standards with a view to selecting a type of load of which the impact is believed to be larger.

The type of the new bridge will be finalised based on the comparative analysis results in terms of structural soundness, safety at the time of construction, economy, ease of maintenance and other critical aspects. The findings of the topographical and geological surveys will also be taken into consideration.

(2) OSBP Facilities

At the Second Bilateral Workshop, a request was made that the new OSBP facilities in the two countries be constructed as a mirror image. In response to this request, the new OSBP facilities in the two countries are designed to perform identical functions (mirror image in terms of function). The required scale of these facilities will be calculated based on the results of the traffic survey conducted as part of the Second Field Survey and the necessary corrections will be made before finalisation. The facilities to be constructed will be strictly limited to those to meet the principles of Japan's grant aid scheme. Private sector facilities, staff accommodation and others are not included in the scope of the

Project although their planned locations will be indicated.

(3) Equipment

Only equipment which is considered suitable for Japan's grant aid scheme will be procured. Other equipment will be provided by each country.

2-2-1-7 Policies Regarding the Construction Method, Procurement Method and Construction Schedule

At present, the border facility premises are heavily congested by large vehicles. In view of this, it will be practically impossible to proceed with the work to construct the new Rusumo Bridge and OSBP facilities as the work vehicles will be unable to move freely. The option of introducing a detour is not feasible. Given the planned construction of the new OSBP facilities in Rwanda some 750 m away towards Kigali from the present border facility site, the work to construct these facilities will commence first so that the new OSBP facilities and car park on the Rwandan side will be able to efficiently handle large vehicles. The work to construct the new Rusumo Bridge and OSBP facilities in Tanzania will then commence.

Interruption to the construction work due to the rainy season is not considered as the rainfall at Rusumo does not considerably vary between the dry season and the rainy season.

In principle, the materials and equipment will be locally procured. Those items which cannot be procured in the local market in Rwanda or Tanzania will be procured in Japan and/or a third country.

2-2-2 Basic Plan (Construction Plan / Equipment Plan)

2-2-2-1 Overall Plan

The Project plans the construction of a stretch of 2,101 m of new roads in total. This consists of 1,315 m (350 m on the new OSBP facility site) in Rwanda, 615 m (250 m on the new OSBP facility site) in Tanzania and 80 m for the new Rusumo Bridge. The size of the new OSBP facility site is 2.6 ha in Rwanda (administration building with a floor space of 1,116 m^2, cargo inspection facility with a floor space of 1,408 m^2 and car park capable of accommodating 33 (large) vehicles). The corresponding site in Tanzania has an area of 1.4 ha (administration building with a floor space of 1,116 m^2, cargo inspection facility with a floor space of 547 m^2 and car park capable of accommodating 22 (large) vehicles)

2-2-2-2 Diagnosis of Durability of the Existing Bridge

The durability of the existing bridge was diagnosed by means of analysing its present state of stress. The suitability of this analysis was verified through comparison between the actual amount of deflection of the bridge measuring during the Second Field Survey period and the amount of deflection suggested by the analysis.

In the Second Field Survey, the Study Team was assisted by the drivers of trailers with a live load. After measuring the axle load of these trailers, the amount of deflection caused by a fully loaded 42 ton trailer (and also a 54 ton trailer) was measured at the central point of the span. A two-dimensional frame analysis model was used for this analysis and the effect of the flaws at the bearing of the hinged support system was taken into consideration. As the measured values and calculated values generally converged as shown in Fig. 2-3, the calculated values were used to investigate the state of stress at each member of the existing bridge.

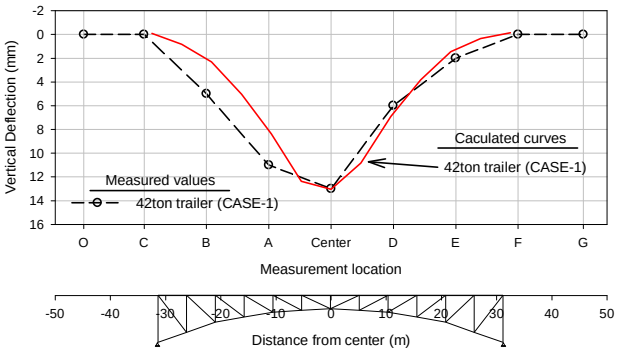


Fig. 2-3 Deflection Caused by a Fully Loaded 42 Ton Trailer

The calculation results indicate that with a fully loaded 54 ton trailer, the members near the supporting points will not satisfy the safety rate of 1.0 but will still satisfy the safety rate of 1.25 for the construction work. These findings suggest that the existing bridge does not satisfy the safety rate of 1.0 for its constant use as a permanent bridge. However, use of the existing bridge during the construction of the new bridge is judged to be feasible as long as the current speed restriction of 5 km/hr and load restriction of an axle load of 8 tons are maintained to allow only those vehicles which satisfy these restrictions.

In regard to the future of the existing bridge, a request was made by the two countries at the second JTC meeting that any decision should be left to the two countries themselves. The reasons cited for this proposal were (i) the possibility of constructing a new railway bridge at the existing bridge location under a future railway project and (ii) the need to secure income to meet the maintenance cost if the existing bridge is used as a pedestrian-only bridge.

Because of this proposal, the design for the Project assumes the non-use of the existing bridge after the completion of the new bridge.

2-2-2-3 Road Plan

(1) Road Standards

The main road to be constructed under the Project will form part of the national highway for which the design speed is, in principle, 50 km/hr. However, the road in question actually functions as a road which connects the border facilities in the two countries and the length is as short as some 2.0 km. Having also considered the steep topography on the Rwandan side, the following road category and

design speed are adopted.

Road category : national highway

Design speed : 30 km/hr

(2) Geometric Design

While Rwanda has no official road design manual, such a manual is available in Tanzania. For the envisaged new road section, the Tanzanian design manual will be used. The "Explanation and Application of the Road Structure Regulations" in Japan will be used to supplement those areas which are not dealt with by the Tanzanian design manual. Table 2-2 outlines these manuals.

Table 2-2 Outline of Geometric Design

Item	Unit	Rwanda	Tanzania	Japan		Adopted Value for the Project
Design Speed	km/hr	-	30	50	30	30
Curve Radius	m	-	50 (30)	≧ 100	≧ 30	74
Minimum Curve Length	m	-	-	≧ 80	≧ 50	80
Cant	%	-	6	< 10		6
Widening at Curved Section	m	-	-	160 > W ≧ 90 90 > W ≧ 60		0.25 0.50
Length of Transition Part	m	-	-	≧ 40	≧ 25	*1
Gradient	%	-	10	< 6 (9)	<8 (11)	10 *2
Vertical Curve Radius	m	-	300 (250)	≧ 800	≧ 250	330
Vertical Curve Length	m	-	-	≧ 40	≧ 25	40

*1 No transition part for a curved section is introduced as the existing road does not have one due to the topographical conditions.

*2 The largest gradient value used for the existing road is adopted in view of the topographical conditions.

(3) Cross-Section Profile

At the third JTC meeting, it was decided that the same lane width and same shoulder width would be employed in both countries. Fig. 2-4 shows the standard width of the new road in both countries (unit: m).

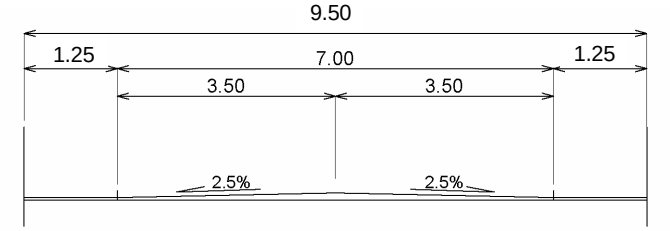


Fig. 2-4 Standard Road Width

(4) Plan Design

The design work for the plan was conducted while ensuring compatibility of the layout plan for the new OSBP facilities.

On the Rwandan side, it is necessary to locate the new OSBP facilities some 750 m away from the existing site towards Kigali. The road between these two sites is currently lined with some houses. Because of the need to completely separate the border facility site from other areas, it has been decided to construct a new fenced road through the steeply sloping area to the north of the existing road. The new road will link the new facilities to the new bridge via the existing border facility site. The curve radius will be 150 m, 130 m or 200 m, which ever is appropriate to ensure the design speed of 30 km/hr.

On the Tanzanian side, the construction of the new OSBP facilities at the existing border facility site is planned. Given the facts that the existing road is steep and that the available land for a new road is extremely limited due to the steep hillsides, it has been decided to use part of the existing road. For this reason, the radiuses adopted for the curved sections are 74.5 m and 74.0 m which are almost the same as those of the existing road. These radiuses satisfy the minimum curve radius of Tanzanian standerd described 50m.

No transitional curve will be introduced because of the inhospitable topographical conditions and also because the existing road has no such curve.

(5) Longitudinal Design

A maximum grade of 10% is adopted for the new road on both sides of the border. However, the grade for the car park area will be 2.5% or less. The vertical curve radius is determined to enable the maintenance of the design speed of, in principle, 30 km/hr.

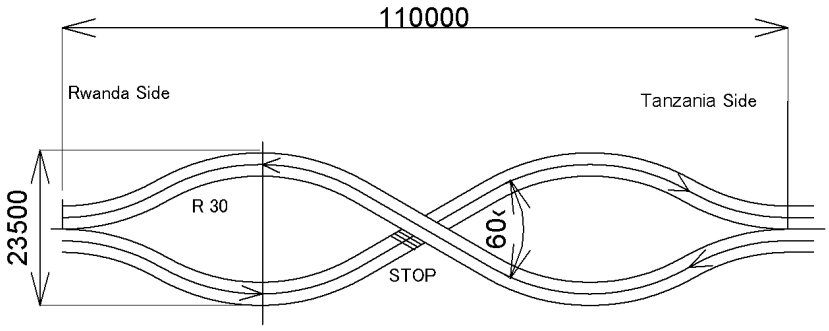
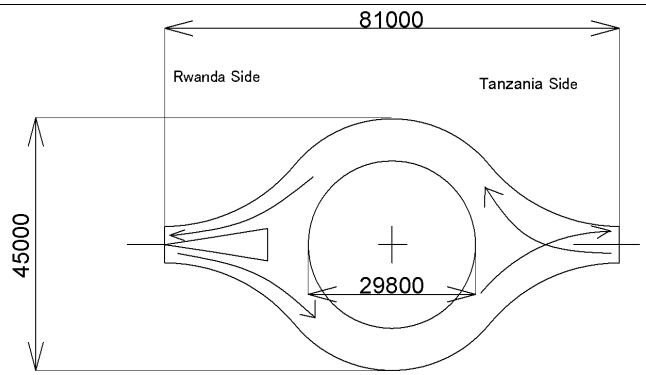
(6) Cross-Sectional Design

Super-elevation runoff is added to the longitudinal section. A cross-sectional slope capable of maintaining the design speed of 30 km/hr has been selected from the available curve radius range.

(7) Shift Between Right-Hand Traffic and Left-Hand Traffic

The level crossing method and roundabout method were compared as shown in Table 2-3 to find a better way of shifting between the right-hand traffic in Rwanda and the left-hand traffic in Tanzania. Option 1, the level crossing method, has been adopted in view of its better safety and economic performance.

Table 2-3 Change Over of Travelling Lane

Option 1: Level Crossing		Evaluation Result
 Area : 2585m2		Good
Site Area	Compared to Option 2, the required site area is smaller and the site can be introduced at the existing border facility site.	
Safety	A sufficient crossing angle allows drivers to easily recognise their travelling direction, making the shift of lane a safe manoeuvre.	
Economy	The overall construction cost is low as the facility can be introduced at the existing border facility site.	
Option 2: Roundabout		Evaluation Result
 Area:3645m2		Fair
Site Area	While the existing border facility site has a narrow rectangular area (38 m x 250 m), the roundabout size is 45 m x 81 m, making the cutting and levelling of the sloping hillside necessary.	
Safety	Drivers face the risk of selecting the wrong lane with the possibility of causing a traffic accident on leaving or entering the roundabout.	
Economy	Compared to Option 1: the overall construction cost is high due to the need to cut and stabilise the slope.	

(8) Paving Design

The existing road uses asphalt paving on the Rwandan side and concrete paving on the Tanzanian side. At the third JTC meeting, members of both countries requested the concrete paving of the entire new road. The reasons for this request were (i) large vehicles will travel at a low speed at the border facility site, (ii) travelling large vehicles will constantly use their brakes as the longitudinal gradient of approximately 10% will be quite steep and (iii) there have been incidents of the asphalt paving at the border facility sites being damaged, significantly reducing the travelability of the road. It has now been decided to apply concrete paving to the new road as asphalt paving will be vulnerable to the heavy vehicle-dominated traffic on this road. The possibility of damaged paving leading to unexpected accidents is another reason for the selection of the more sturdy concrete paving. The OSBP premises (including the car park) will also have concrete paving as the paving will be greatly affected by the frequent stopping and starting of vehicles as well as much manoeuvring of the steering wheel.

Meanwhile, the new Rusumo Bridge will have asphalt paving to ensure waterproofing of the concrete slab. Asphalt paving will be used for the road replacing the existing road outside the new OSBP facilities in Rwanda as it is unlikely that this road will be used by many large vehicles.

- Road Paving (Concrete Paving)
  As both Rwanda and Tanzania have no design standards for concrete paving, the Paving Design Handbook of Japan will be referred to.

  Ordinary concrete paving
  Design traffic volume: T<250 vehicles/day/direction
  Concrete paving thickness: 150 mm
  Subgrade: 150 mm (mechanical stabilization gravel)
  Design CBR: ≧ 15%

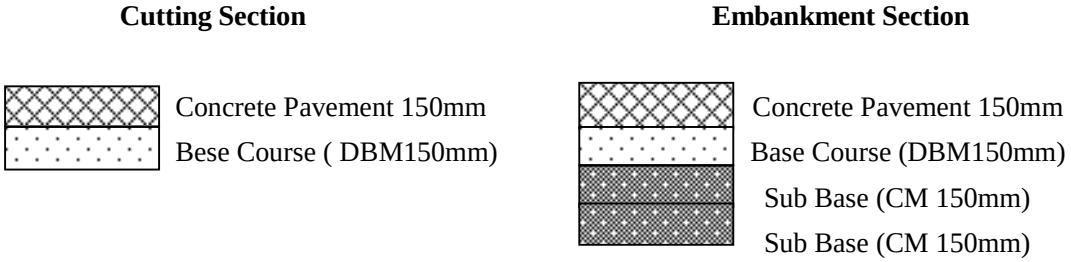


Fig 2-5 Concrete Paving of the new road

- Bridge Paving (Asphalt Paving)
  Bridge paving functions to ensure comfortable travelling by vehicles and to create a waterproofing layer to protect the concrete slab by means of preventing the infiltration of rainwater. As there are no relevant design standards in Rwanda or Tanzania, the Paving Design Handbook of Japan will be referred to.

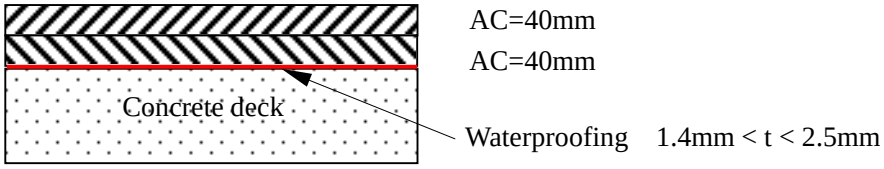
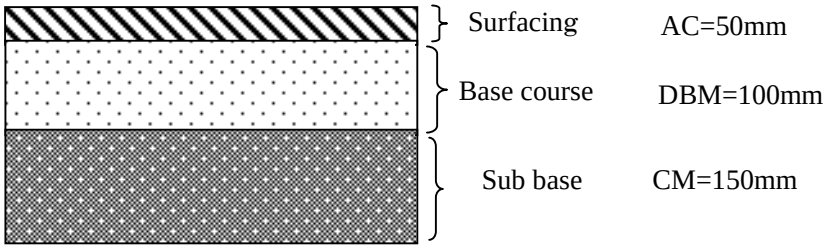


Fig. 2-6 Configuration of Bridge Paving

- Paving of the Existing Road in Rwanda (Asphalt Paving)



Design CBR ≧ 15%

Fig. 2-7 Asphalt Paving of the Existing Road

(9) Fencing

As the project site is located along the international border between Rwanda and Tanzania, the introduction of fencing is essential to prevent illegal entry or the escape of criminals and other people. Even Japan has no installation standards for such fencing. Given the importance of the security of border facilities, the perimeter fencing will have a height of at least 1800 mm with an outrigger section at the top. Fig. 2-8 shows an example of security fencing.

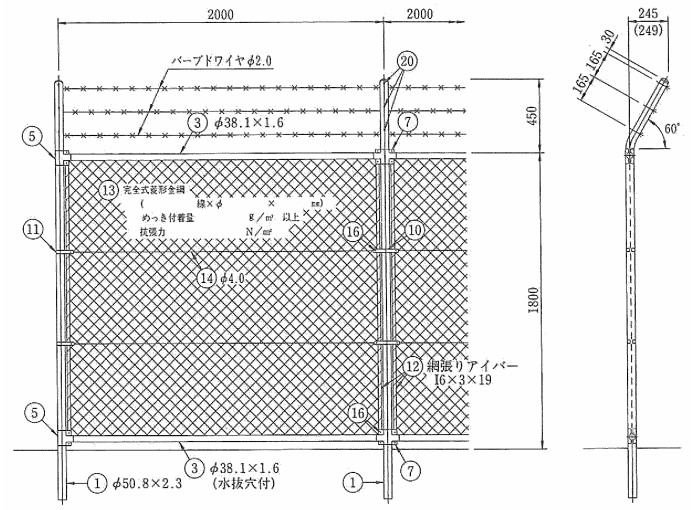


Fig. 2-8 Example of Security Fencing

（10） Lighting Device

Because of the planned 24 hour operation of the new OSBP facilities, the introduction of lighting installations is considered to illuminate the OSBP car parks and new Rusumo Bridge. The basic concept for the lighting for the OSBP car parks is explained below.

① The standard illumination intensity is 10 lx (or higher which is the average value for highway service areas.

② Both car parks will be provided with two units of floodlights (three 700 W floodlights each) (see the illumination distribution chart).

③ As the power demand for lighting is some 5 KVA, the power cubicle to be installed at the administration building should be able to handle this.

2-2-2-4 Bridge Plan

（1）Design Conditions

1）General Conditions

Road class	:	national highway
Design speed	:	50 km/hr (30 km/hr for slow sections necessitated by the local topographical conditions)
Road width	:	1.0 m + 0.5 m + 2 x 3.25 m + 0.5 m + 1.0 m = 9.5 m (see Fig. 2-12)
Bridge length	:	80 m
Type of superstructure	:	simple composite steel box girder (use of atmospheric corrosion-resistant steel)
Type of substructure	:	reversed T type abutments
Type of foundations	:	spread foundations
Type of concrete slab	:	RC slab
Paving	:	asphalt paving 80 mm thick (40 mm + 40 mm)
Applied standards	:	Specifications for Highway Bridges (Japan Road Association, March, 2002); Tanzanian standards
Existing bridge	:	deck type arch bridge

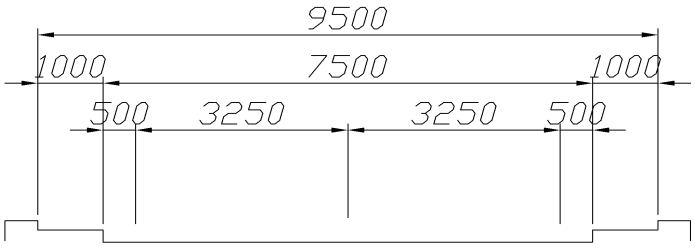


Fig. 2-9 Configuration of Bridge Width

2）Load Conditions

Live load	:	B live load (Specifications for Highway Bridges); NA+45NB (SATCC)
Wind load	:	W1 = 1.5 kN/m² (without live load) W2 = 1.0 kN/m² (with live load) (STACC 3.8 Wind Action)
Design lateral seismic factor	:	kh - 0.1 (referring to the Preliminary Design Report for the Regional Rusumo Falls Hydroelectric and Multi-Purpose Project)

3) Materials

Concrete		
Superstructure	:	σck = 24 N/mm (RC slab)
Substructure	:	σck = 24 N/mm (abutment and footings)
Curb	:	σck = 24 N/mm
Steels		
Superstructure	:	SMA400W, SMA490W (stabilised atmospheric corrosion-resistant steels)
Substructure	:	SD345 (abutment and footings)
Slab/curb	:	SD345

4) River Conditions

Name of river	:	(A)kagera River
Planning for river		:The Rusumo Dam Project plans the construction of a dam near the new bridge location (Regional Rusumo Falls Hydroelectric and Multi-Purpose Project)

5) Incidental Facilities

Expansion device	:	steel finger joint type (non-drain type)
Drainage system	:	collection of water through a catch basin before discharge to the river
Guard fence	:	guard fence also acting as handrails (Type A); 1,100 mm high from the road surface
Inspection way	:	superstructure: none substructure: none
Lighting device	:	yes
Additional installations	:	none
Seismic device	:	longitudinal direction: sufficient template length is secured (A1 and A2 abutments)

transverse direction: none

(2) Determination of the Bridge Length

1) Basic Policies

Even though the planned abutments for the new bridge will be located on a steep slope, spread foundations will be used due to the existence of hard bedrock at a relatively shallow depth. The exact location of each abutment is planned to have a clearance of half the width of B (B is the width of the footing in the longitudinal direction) or larger between the front end of the footing and the slope so that the abutment can be safely constructed on stable ground. The front of the new abutments will be located beyond the location of the arc abutments of the existing bridge to avoid any adverse impacts on the adjacent existing bridge.

2) Determination of the Bridge Length

When a bridge is planned across a V-shaped valley, a longer bridge length (i.e. location of the abutments away from the actual valley) generally reduces the proportion of the substructure cost in the overall construction cost but increases the superstructure cost, making the overall cost performance of the construction work uneconomical.

This general cost performance prospect is applicable to the planned new Rusumo Bridge. Therefore, locationing of the abutments as close as possible to the valley section to shorten the bridge length has enabled the production of an economical bridge design for the Project. In this design, the bridge length is 80 m which is the same as the length of the existing bridge.

A1 abutment (Rwandan side) STA 1 + 95.0 m

A2 abutment (Tanzanian side) STA 2 + 15.0 m

3) Bridge Site

There is space for the construction of the new bridge both upstream and downstream of the existing bridge and the introduction of an 80 m long bridge is possible at both sites. When considering the distance from Rusumo Falls, however, the locationing of the new bridge downstream of the existing bridge will secure a longer distance from the falls and is advantageous in terms of workability and other aspects. The locationing of the new bridge downstream also offers better horizontal alignment as well as vertical alignment given the topography on the Tanzanian side and the alignment of the existing road.

The fact that the Regional Rusumo Falls Hydroelectric and Multi-Purpose Project is planned to be implemented upstream of the existing bridge makes the downstream locationing of the new bridge the preferred option in the case of the implementation of this project in the future.

Based on the above arguments, it has been decided to locate the new bridge downstream of the existing bridge. It has also been decided that a minimum distance of 15 m between the centre lines of the existing and new roads on the two bridges will be secured to avoid any adverse impacts of the

excavation work for the new bridge on the existing bridge and to reduce any additional load on the existing abutments.

(3) Selection of Superstructure Type

The topography at the planned site for the new Rusumo Bridge is characterised by steep slopes on both banks of (A)kagera River with the nearby Rusumo Falls in the upstream. Because of the short distance from Rusumo Falls, the flow velocity of (A)kagera River at the planned bridge site is fairly high, making the construction of piers in the river area difficult. Meanwhile, the siting of piers on the steep sloping banks will necessitate highly dangerous excavation work and it will be difficult to ensure work safety. For these reasons, the new bridge is designed to be a single span bridge without piers. Fig. 2-10 shows the situation at the planned bridge site.

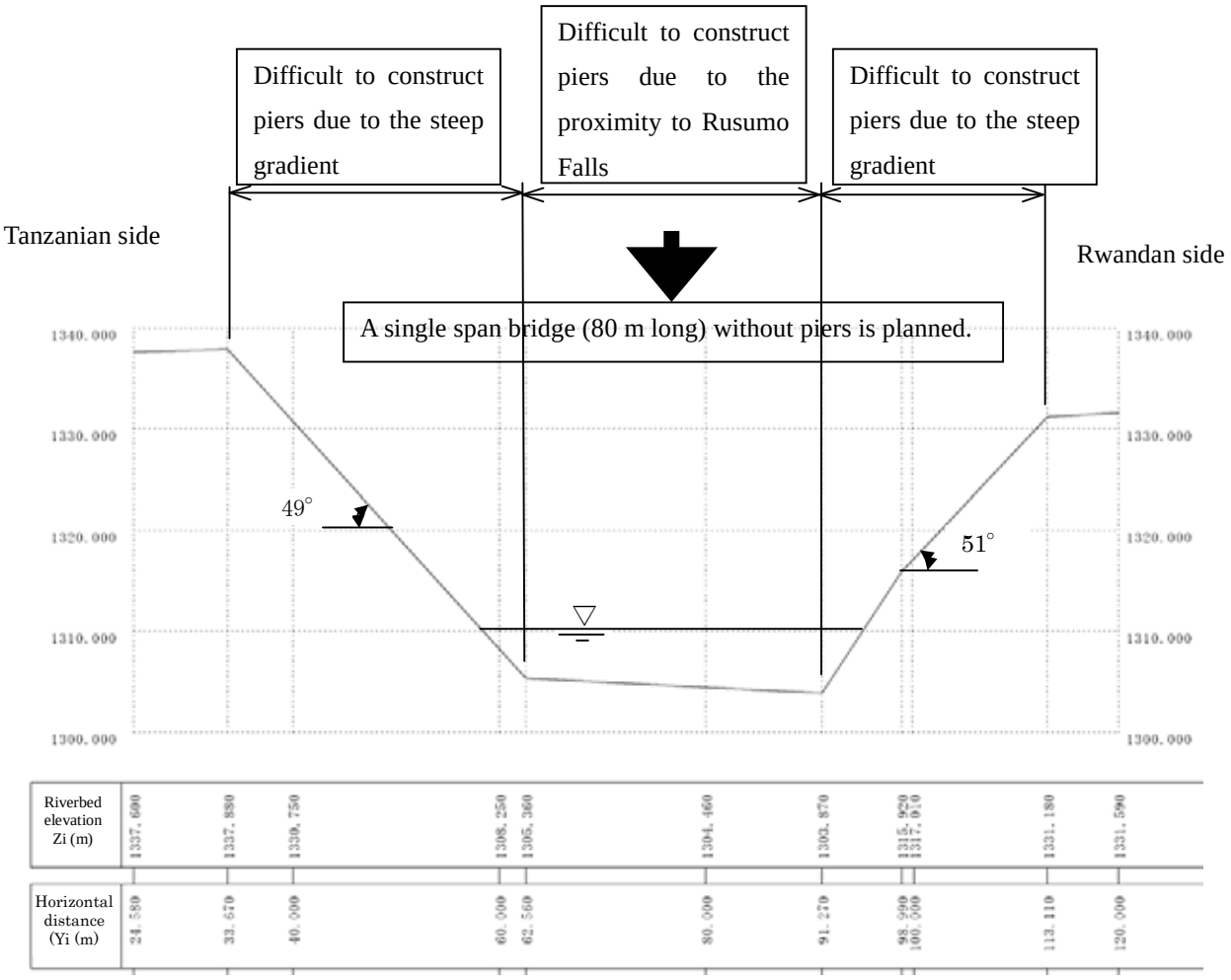


Fig. 2-10 Situation at the Planned bridge Site

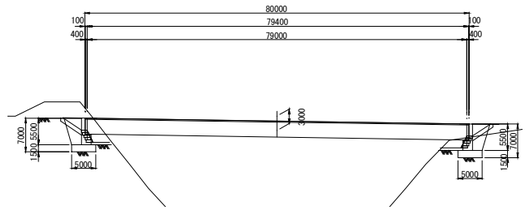
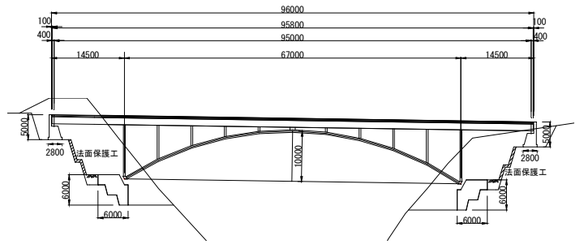
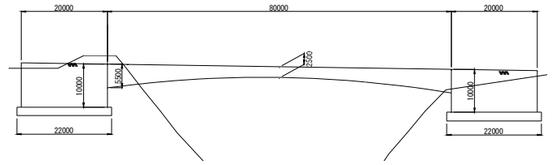
Given the basic bridge design of an 80 m long single span bridge, feasible bridge types were selected using Japanese examples.

Through type steel arch bridges, steel truss bridges and concrete half-through arch bridges all have their main girders above the road surface. A bridge may fall when the main girder is accidentally

hit by a vehicle. Given the facts that local vehicles often break down and that the alignment of the adjacent road sections is dominated by a steep gradient and sharp curve, the adoption of any of these three bridge types is believed to be difficult from the viewpoint of safe operation after completion. Moreover, both countries have expressed concern in regard to the new bridge becoming a bottleneck for the transportation of ultra large and tall items, which were not considered for the present bridge design but which may use the bridge in the future, if a bridge design with some members placed above the road is selected. There is, therefore, strong opposition to the selection of any bridge type, such as a through type steel arch bridge, where the main girders are positioned above the road.

Based on the above conditions for the selection of the bridge type, three bridge types were compared, i.e. concrete box girder bridge, steel deck type arch bridge and simple composite steel box girder bridge. Table 2-4 shows the comparison results. The Study Team decided to recommend a simple composite box girder structure (using atmospheric corrosion-resistant steel) for the superstructure of the new Rusumo Bridge because of the superior economy and safety of the construction of this type of bridge structure.

Table 2-4 Comparison of Different Types of Superstructures

			
Type	Steel simple composite box girder	Steel deck type arch bridge	PC box girder with center hinge bridge
Structure	Concrete slab is attached to a steel box girder. A girder bridge with a length of 80 m is made possible by creating an effective cross-section made up of steel girders and concrete slab. In consideration of the limitations on the girder height due to transportation over land, the two box girder type should be selected.	With this arch bridge, the structural members are placed under the road. The structure is composed of stiffeners supporting the floor system and vertical steel/arch ribs supporting the stiffening girders. The stiffening girders bear the bending moment while the vertical steel and arch ribs bear the compressive force. As the foundations for the arch are located in safe construction areas, the bridge length is longer than that of other types.	This PC box girder bridge is constructed by the cantilever method from abutments which are integral to the main girders and which have a counter function at the time of construction. The resulting box abutments are quite large. As the centre point of the span is hinged, there is concern regard to its sagging due to creeping after completion.
Workability	The topographical restrictions mean that it is difficult to introduce supports but the use of the letting off method enables the erection of girders. The concrete slab is constructed after erection of the girders and is integrated to the girders. Painting is not required because of the use of atmospheric corrosion-resistant steel. This is the most simple structure and has the least number of construction stages.	This bridge is constructed by the cable erection (direct hoisting) method. The construction of foundations for the arch as part of the substructure is necessary, making excavation of the slope and concrete placing necessary. As the excavation area to house the foundations for the arch extends to the area of one abutment, it is necessary to push back this abutment, resulting in a bridge length of 96 m.	This bridge is constructed by the cantilever method using a wagen. The work safety prospect is inferior to that for other bridges because of work above the river. Plain concrete is placed inside to increase the abutment weight. The scale of the abutments is large and the excavation volume of the bedrock exceeds 10,000 m^3. This excavation work alone takes more than six months to complete. Therefore, the on-site construction period is the longest.
	○	△	△
Procurement Prospects	Careful transportation is required because of the tall girders but it is possible to split the girders into upper and lower sections. Atmospheric corrosion-resistant steel must be imported from Japan as it is not available locally.	Atmospheric corrosion-resistant steel must be imported from Japan as it is not available locally.	Because of the use of high strength concrete (Σck = 40 N/mm^2), quality control is important.
Safety of Construction Work and After Completion	As the girders can be assembled on the ground, the volume of the work above the river is smaller than in the case of other bridges. As such, this bridge is superior in terms of work safety. There is sufficient clearance from the water level and the bridge is hardly affected by flooding.	There is a possibility of the bridge being affected by flooding. Therefore, the safety after completion is inferior to that of other bridges.	In view of possible sagging at the central point of the span, careful attention must be paid to the camber at the time of construction. Constant measuring is required to ensure the stability of the substructure during the work, especially of the abutment to prevent their rolling over.
	○	△	△
Maintain-ability	As the members are located below the roadbed, introduction of inspection ways is required. The use of atmospheric corrosion-resistant steel can improve the maintainability as painting is not required.	As the members are located below the roadbed, scaffolding is required to inspect the vertical steel and arch ribs. The use of atmospheric corrosion-resistant steel can improve the maintainability as painting is not required.	The concrete structure is highly durable unless initial flaws occur. Inspection must focus on sagging at the centre of the span and rainwater incursion at the hinged section.
	○	△	○
Economy (Direct Cost)	In the case of a simple 80 m long girder structure, a steel deck is possible instead of concrete slab. However, a steel deck is rejected here as high temperature can cause cracks and/or loss of the road paving. This type is more economic than the other options.	The arch span of 67 m is shorter than the through arch bridge option but the substantially larger scale of the bedrock excavation work to create the foundations for the arch lengthens the bridge to 96 m. As a result, the economy of this bridge is inferior to the steel box girder option.	The cost of the abutments is extremely high and the economy is the worst of all options.
	Superstructure 534,700,000JPY Sub Structure 25,300,000JPY Total 560,000,000JPY (1.00 (◎))	Superstructure 575,000,000JPY Sub Structure 52,000,000JPY Total 627,200,000JPY (1.12 (○))	Superstructure 382,400,000JPY Sub Structure 272,800,000JPY Total 655,200,000JPY (1.17 (△))
Preference of the Two Countries	Third	Second	First
Evaluation Ranking	First	Second	Third

(4) Selection of Substructure Type

1) Selection of Foundation Type

Spread foundations are selected for the new bridge as the bearing stratum (soft rock) begins to appear at approximately GL-3 m at the planned bridge site.

2) Selection of Abutment Type

The required structural height of the abutments for the new bridge is around 7 - 9 m assuming a suitable type of superstructure at the planned bridge site as shown in Fig. 2-11. This height is fully sufficient to accommodate the abutment height from the planned road surface to the bearing stratum (soft rock).

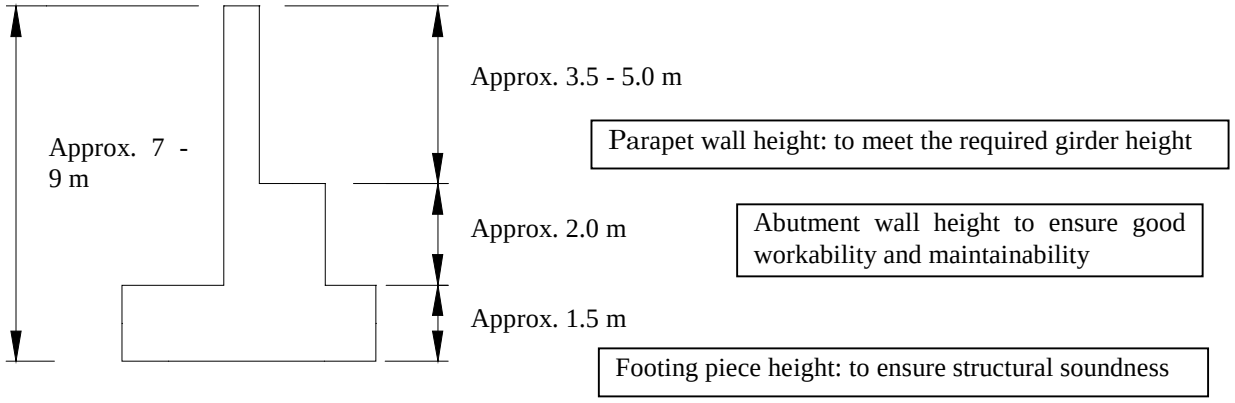


Fig. 2-11 Examination of the Required Abutment Height

As an abutment height of approximately 7.0 - 9.0 m is necessary to meet the structural requirements, common reversed T type abutments are adopted from the viewpoint of workability and economy.

(5) Examination of the Main Girder Height

An economical main girder height was examined for the simple steel composite box girder (concrete slab) type selected for the superstructure by changing the girding height and roughly calculating the total weight of the steel in order to find the girder height with the lowest steel weight. This exercise led to an optimal girder height of 4.0 m. The conditions for this examination are listed below.

Examination Conditions

- Girder web height : 3,000, 3,500, 4,000 and 4,500 mm
- Girder type : simple steel composite box girder; simple steel non-composite box girder
- Steel : SMA490W
- Cross-section : no constraints on the plate thickness or bolt layout

Examination Results

Fig. 2-12 shows the examination results for the girder height. A girder height of 4.0 m was selected for an improved girder performance in terms of economy and deflection. The selected girder type is a simple composite box girder.

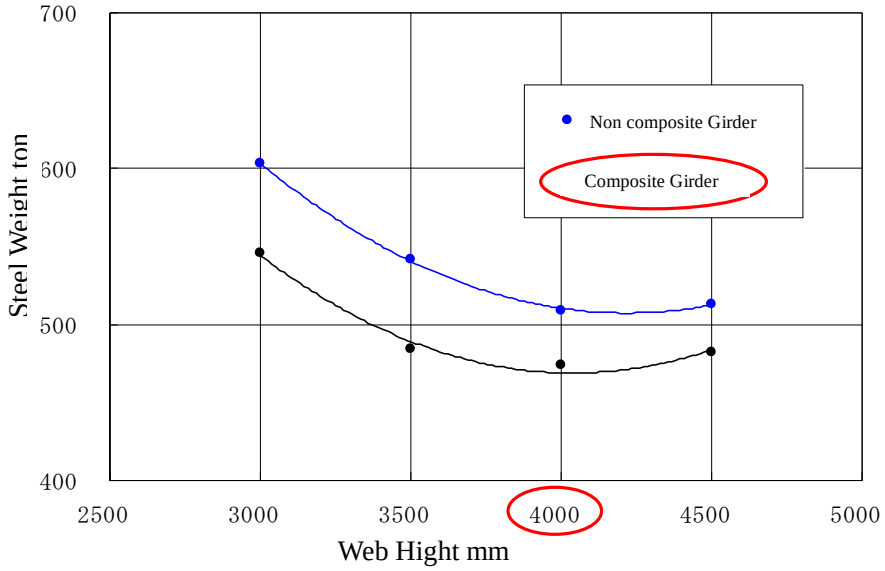


Fig. 2-12 Steel Box Girder Height: Comparison of Steel Weight

(6) Examination of the Use of Atmospheric Corrosion-Resistant Steel

The effects of the use of atmospheric corrosion-resistant steel (coated with a rust stabilisation agent) for the steel girders was examined in response to the concern expressed by the governments of the two countries regarding a massive maintenance cost in the future for the repainting of the steel girders. Table 2-5 and Fig. 2-13 compare the costs of steel requiring painting (painted with a fluorine resin) and atmospheric corrosion-resistant steel. Although the initial investment for stabilised atmospheric corrosion-resistant steel is some JPY2.1 million more, the economic performance is reversed with the first repainting after 20 years. Atmospheric corrosion-resistant steel is not available in the local market and procurement in a neighbouring country is also difficult. The most likely supply source for the Project at present is Japan.

Table 2-5 Comparison Between Atmospheric Corrosion-Resistant Steel and Fluorine Resin Painted Ordinary Steel

		SM490YB	SMA490BW(Atmospheric Corrosion-Resistant Steel)
Shop painting	Painting work	C-5	Stabilisation
	Unit cost	JPY6,500/m^2	JPY5,900/m^2
	Painting cost (4,900 m^2)	JPY31.85 million	JPY28.91 million
First repainting	Painting work	Rc-1	None
	Unit cost	JPY11,500/m^2	
	Painting cost (4,900 m^2)	JPY5.63 million	
Second repainting	Painting cost (4,900 m^2)	JPY5.63 million	
Third repainting	Painting cost (4,900 m^2)	JPY56.3 million	

Note: In view of the normal practice of repainting, it is assumed that partial repainting is conducted every 20 years to cover 10% of the total painted area and that repainting of the entire area is conducted in the 60th year. The cost calculation is based on a total steel weight of 280 tons and a total painting area of 4,900 m^2

	SM490YB	SMA490BW(Atmospheric Corrosion-Resistant Steel)
Standard extra	¥16,000/ton	¥34,000/ton
Material cost (280 tons)	¥4.48 million	¥9.52 million

	SM490YB	SMA490BW(Atmospheric Corrosion-Resistant Steel)
Material cost	¥4.48 million	¥9.52 million
Shop painting cost	¥31.85 million	¥28.91 million
Sub-total	¥36.33 million	¥38.43 million
Difference in initial cost		+ ¥2.1 million
First repainting cost	¥5.63 million	
Second repainting cost	¥5.63 million	
Third repainting cost	¥56.3 million	
Sub-total	¥67.56 million	
Cost difference	+ ¥65.46 million	

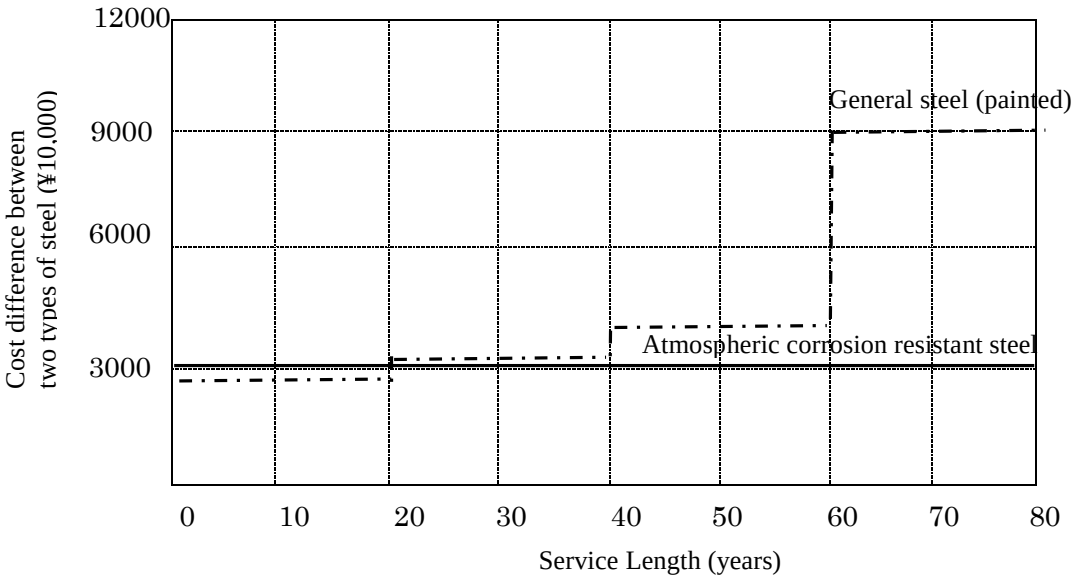


Fig. 2-13 Cost Comparison Between Atmospheric Corrosion-Resistant Steel and Painted General Steel

(7) Examination of the Slab Thickness

The slab thickness is determined in accordance with the Specifications for Highway Bridges. The finalised slab thickness must take the heavy traffic of large vehicles across the bridge into consideration.

Minimum Slab Thickness

do = 30 L + 110 = 182 mm L = 2.4 (m): slab span for load

T (m)

Slab Thickness

$d = k_1 \times k_2 \times do = 1.10 \times 1.0 \times 182 = 200.2 = 200$ (mm)

$k_1 = 1.10$: design traffic volume of large vehicles per direction $\leqq 500$ vehicles/day

k_2 = 1.0: difference in rigidity of slab supporting girders → no difference

(8) Examination of the Substructure and Foundations

1) Ground Conditions

The soft rock formation appearing around the GL -3 m point is considered to be the bearing stratum. The average converted value of N was calculated using the standard penetration test results and the values of parameters C and ∅ used for the design were estimated using the expression shown in Table 2-6.

Table 2-6 Estimation of C and ∅ Values from the Converted Value of N

		Sandstone・Pebble Gravel Plutonic Rock	Andesite	Mudstone・Tuff・Tuff Breccia	Note
Ductility C	Relation of N Value and Average C	$15.2N^{0.327}$	$25.3N^{0.334}$	$16.2N^{0.606}$	
	Standerd Deviation	0.218	0.384	0.464	
Shear Strength φ (°)	Relation of N Value and Average φ	$5.10Log_{10}N+29.3$	$6.82Log_{10}N+21.5$	$0.888Log_{10}N+19.3$	
	Standerd Deviation	4.40	7.85	9.78	

Source: Japan Highway Public Corporation, Design Guidelines Version 2

(9) Selection of the Type of Guard Fence

As a sidewalk will be introduced on both sides of the carriageways of the new Rusumo Bridge, a guard fence which will also act as a handrail will be erected along the sidewalk.

Type of guard fence: Type A

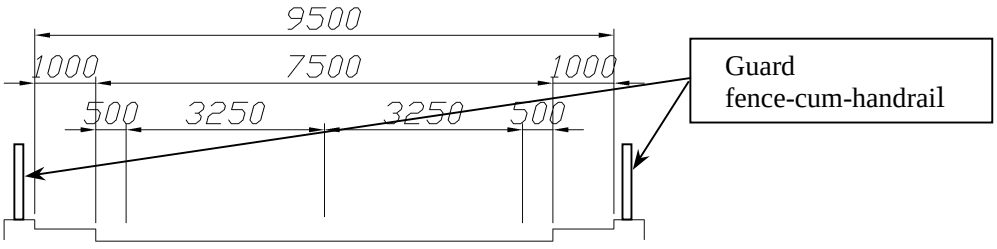


Fig. 2-14 Locations of Guard Fence

(10) Examination of Bearings

Fixed/movable bearings will be used. Rubber bearings are selected based on the comparison results shown in Table 2-7.

Table 2-7 Comparison of Rubber Bearings and Steel Bearings

	Rubber Bearings	Steel Bearings
Friction Factor	The friction factor of movable bearings is 0.10, causing little impact on the substructure.	The friction factor of steel bearings is 0.15, causing much impact on the substructure.
Quake Resistance	As the surface dimensions are large, it is less likely that damaged bearings will develop an uneven road surface. Steel sections offer excellent ductility due to the use of general steel.	The small surface dimensions mean a higher likelihood of the development of an uneven road surface once the bearings are damaged. Steel sections have less ductility due to the use of cast steel.
Evaluation result	○	△

(11) Examination of the Expansion Joints

Steel finger joints are selected for the expansion joints as they have proven durability through their frequent use.

Table 2-8 Comparison of Different Expansion Joints

	Steel Finger Joints	Rubber Joints
Durability	Excellent	Less durable; eventual replacement during the bridge service period is assumed
Waterproofing	Excellent	Excellent
Applicability to new Rusumo Bridge	No problem given the girder opening value of 100 mm	No problem given the girder opening value of 100 mm
Past records	Most commonly used type of joint for steel bridges	Less used for steel bridges
Evaluation results	○	△

(12) Examination of Drainage System

Catch basins will be introduced at intervals of 20 m in the longitudinal direction inside (carriageway side) the kerb at the boundary between the sidewalk and carriageway.

Collected water is discharged to the river via drainpipes without splashing over the main girders and other members of the bridge.

2-2-2-5 OSBP Facilities

(1) Outline

As the bilateral agreements should provide the basis for the design of the OSBP facilities, a tentative plan was put forward for the OSBP facilities in the two countries and the introduction of a control zone between the two OSBP facilities in the Second JTC Meeting. The necessary bilateral agreements were subsequently concluded in March, 2010. In the Second JTC Meeting, several operational arrangements for the OSBP facilities were agreed upon by the two countries. These arrangements are (i) joint verification at the facility of the entering country, (ii) the adoption of the Juxtaposed type and (iii) joint verification and inspection for passport control and customs clearance purposes.

At present, staff members of other government agencies (Ministry of Health, Ministry of Agriculture, Ministry of Fishery and others) are posted at the border post in addition to immigration

officers, customs officers and policemen of each country. These offices are scattered and their allocated office areas far from one agency to another.

The traffic volume at the Rusumo Border Post has recorded an annual growth rate of 5 - 6 % as the number of vehicles passing this border post was 21,971 in 2007, 23,103 in 2008 and 24,515 in 2009. Meanwhile, the Rwanda's GDP has recently recorded an average annual growth rate of 7.1% (5.8% in 2007, 6.0% in 2008, 11.2% in 2009 and 5.5% in 2010). Cargo traffic primarily moves from Tanzania to Rwanda and trucks returning from Rwanda to Tanzania are often empty. Many of these trucks unload their cargo at a bonded warehouse on the Rwandan side without actually entering Rwanda and return to Tanzania to avoid the road maintenance levy at the Weigh Bridge situated between Rusumo and Kigali.

There is a rule that any cargo moving from Tanzania to Rwanda which is valued at one million Rwandan francs (RWF) must be inspected at the dry port in Kigali. As trucks carrying many cargoes must undergo a document check for the attachment of a seal to each cargo, they are essential stopped three times for border crossing. At the Rusumo Border Post, it takes an average of four hours for a truck to enter Rwanda from Tanzania. Document check and the physical verification of cargo take place at the dry port in Kigali and the traffic queue can be as long as 6 - 10 hours.

To ease such congestion, the introduction of OSBP facilities was proposed by both countries to copy the international border facilities of other African countries. The Project is planned to facilitate the smooth traffic of international cargo through the development of infrastructure for international physical distribution. The other aims of the Project are (i) improvement of the efficiency of passport control and customs inspection and (ii) improvement of the working conditions and improvement of the user convenience at the border post.

To determine the scale of the OSBP facilities to be constructed under the Project, the expected manpower level and staff deployment as of 2015 were inferred in view of the existing departments and their facilities. A suitable scale for each facility was then examined for each border post function while ensuring that the configuration of the facilities and details of each facility conform to the principles of Japan's grant aid scheme.

(2) Target OSBP Facilities

To achieve the aims described above, the Project intends the construction of a car park of an adequate size, administration building to integrate various departmental offices, verification storage/truck terminal, control shed and other OSBP facilities on both sides of the border. The joint passport control and customs inspection through a one-stop & single-window system will improve the efficiency of such work and the international physical distribution function of the border post will be much improved.

Configuration of OSBP Facilities

- Administration building :passport control, customs, police, quarantine and other departments
- Verifiation storage :physical inspection area and off-loading warehouse
- Control shed :visual inspection and final document check
- Guardhouse
- Public toilets, generator room and others

For the planning of the OSBP facilities, the Study Team proposed (i) the construction of the OSBP facilities while using the existing facilities and (ii) the location of the OSBP facilities on the Rwandan side at a gently sloping site some 750 m inland from the present site as expansion of the present site will necessitate massive civil engineering work in a narrow space between the steep hillside and steep river bank. These proposals were accepted by the two countries.

(3) Car Par

1) Traffic Volume Survey

A traffic volume survey was conducted in 2009 as part of the Preliminary Study and a further traffic survey was conducted in February, 2010 during the Second Field Survey to obtain more detailed data. The latest survey measured the types of vehicles and the passing time by each type of vehicle at three points, i.e. the border point on the Rwandan side, the existing bridge and the border point on the Tanzanian side, for the purpose of estimating the transaction time by type of vehicle. This traffic volume survey determined not only the traffic volume but also the type of each vehicle, transaction time on both sides of the border and other aspects of the border traffic and estimated the traffic trends, peak times and average transaction time by each direction.

Table 2-9 Traffic Volume Survey Results

Traffic Survey (Feb. 2010) and Forecast of Number of Passenger

To Rwanda in Feb. 2010

	Pedestrian	Motorcycle (I)		Light Vehicle (II)			Heavy Vehicle (III)				Total	I	II	III
		Bicycle	Motorcycle	Sedan	Pickup Track	Minibus	Bus	Track	Liquid Tank	Trailer				
Total	**186**	**0**	**4**	**17**	**0**	**0**	**1**	**29**	**8**	**10**	**69**	4	17	48
Passenger / Vehicle	1.0	1.0	1.2	2.5	3.0	10.0	20.0	2.0	2.0	2.0				
Total Passenger	186	0	5	43	0	0	20	58	16	20	**161**	5	43	114
Average Passenger / Type												1.2	2.5	2.4

To Tanzania in Feb. 2010

	Pedestrian	Motorcycle (I)		Light Vehicle (II)			Heavy Vehicle (III)				Total	I	II	III
		Bicycle	Motorcycle	Sedan	Pickup Track	Minibus	Bus	Track	Liquid Tank	Trailer				
Total	**151**	**0**	**13**	**4**	**0**	**0**	**1**	**41**	**12**	**11**	**82**	13	4	65
Passenger / Vehicle	1.0	1.0	1.2	2.5	3.0	10.0	20.0	2.0	2.0	2.0				
Total Passenger	151	0	16	10	0	0	20	82	24	22	**174**	16	10	148
Average Passenger / Type												1.2	2.5	2.3

2) Analysis of the Traffic Volume Survey Results

As the Government of Rwanda is planning to transfer the dry port in Kigali to Rusumo, the ratio of each channel under the ASYCUDA++ system at the Kigali Dry Port was referred to for estimation of the required area for the physical verification work and also for the required capacity of the new car park at Rusumo.

Firstly, the estimated daily traffic volume in 2015 based on the assumed average annual traffic volume growth rate of 6% was proportionally distributed to each direction and types of vehicles established by the latest traffic volume survey in order to establish the hourly traffic volume and number of vehicles subject to physical verification. In regard to the transaction time, a target time of two hours from the present four hours was adopted. This target will be achieved through the introduction of the OSBP facilities and ITC system. Meanwhile, the target time to pass through the Red channel for physical verification at the dry port was set at three hours from the current 8 - 10 hours, then the number of general parking lot and parking area for verification storage was estimated. On the Tanzanian side, the peak hours only last from 06:00 to 08:00 and the average transaction time is as short as 30 minutes, suggesting that there is a full turnover of vehicles every hour. Therefore, the number of vehicles used for the estimation was two-thirds of the maximum number.

Based on the above conditions, the number of parking spaces was determined to be 33 for heavy vehicles and six for light vehicles at the OSBP facilities in Rwanda and 22 for heavy vehicles and five for light vehicles at the OSBP facilities in Tanzania. The number of parking spaces at the verification storage in the verification syorage was determined to be seven in Rwanda and two in Tanzania. The number of parking spaces at the off-loading warehouse was determined to be five in Rwanda as the peak time average number of trucks using this facility was calculated to be an average of four based on the traffic volume survey for two days (to increase to approximately five by 2015). In Tanzania, while no comparable data was obtained by the traffic volume survey, the infrequent use of the off-loading warehouse at present still suggests the need to introduce some parking spaces. It was, therefore, decided to introduce one space as a flexible arrangement to serve the off-loading warehouse.

Table 2-10 Transaction Time

Transaction Time to Rwanda						
Heavy Vehicles	**Average**	**4:03**	**Feb.19**	**3:59**	**Feb.20**	**4:08**
	Average in Peak Time	**3:55**	**Feb.19**	**3:39**	**Feb.20**	**4:12**
Light Vehicles	**Average**	**3:52**	**Feb.19**	**4:34**	**Feb.20**	**3:10**
	Average in Peak Time	**3:52**	**Feb.19**	**3:30**	**Feb.20**	**4:14**
Transaction Time to Tanzania						
Heavy Vehicles	**Average**	**1:02**	**Feb.19**	**1:02**	**Feb.20**	**1:02**
	Average in Peak Time	**0:32**	**Feb.19**	**0:31**	**Feb.20**	**0:34**
	Number of Vehicles: Transaction Time > 1 Hour	**5.385%**	**Feb.19**	**3**	**Feb.20**	**4**
Light Vehicles	**Average**	**1:38**	**Feb.19**	**2:39**	**Feb.20**	**0:37**
	Average in Peak Time	**0:53**	**Feb.19**	**1:09**	**Feb.20**	**0:37**
	Number of Vehicles: Transaction Time > 1 Hour	**25.0%**	**Feb.19**	**2**	**Feb.20**	**0**

Table 2-11 Calculation of the Number of Passengers and Required Scale of the Car Park (Rwanda)

Calculation for Number of Passenger and Parking Lot							
To Rwanda							
			Pedestrian	Motorcycle	Light Vehicle	Heavy Vehicle	**Total**
1	**Traffic Volume in 2010**	**Average**		**4**	**17**	**48**	**69**
	Traffic Volume in Peak Time (3:55 Hours)	**/ Hour**			**11**	**30**	
	Traffic Volume for Cargo Trucks in Peak Time	**/ Hour**				**22**	
	Parking Vehicles for Truck Terminal	**TZ→TZ、RW→RW / Peak Time**				**4**	**4**
	Number of Passenger in 2010	**Persons / Day**	**186**	**5**	**43**	**114**	**347**
2	**Traffic Growth from 2010 to 2015**	6% / Year	133.80%	133.8%	133.8%	133.8%	
3	**Traffic Volume in 2015**	**/ Day**		5	23	64	92
	Traffic Volume in Peak Time (3:55 Hours)	**/ Hour**			**15**	**40**	**55**
	Traffic Volume for Cargo Trucks in Peak Time	**/ Hour**				**29**	
4	**Number of Passenger in 2015**	**Persons / Day**	**249**	**6**	**57**	**153**	**465**
5	**Parking Vehicles**						
	Parking Vehicles for Document Check	**2 Hours x Traffic Volume in Peak Time**			**6**	**33**	
	Detailed Verification for Red Channel	**3 hours for 15% of Cargo Trucks**				**6**	**6**
	Parking Vehicles for Truck Terminal	**TZ→TZ、RW→RW / Peak time**				**5**	**5**
6	**Number of Passenger**	Average of Operation Hour (12h)	21	1	12	30	63
		2 hours: in Peak Time	7	0	15	78	**100**
		3 hours for Detailed Verification			0	14	**14**
7	**Designed Number of Parking Lot**	**Lot**			**6**	**33**	
	Designed Number of Parking Lot for Verification Storage	**Lot**				**6**	
	Designed Number of Parking Lot for Truck Terminal	**Lot**				**5**	
8	**Designed Number of Seats in Admin. Build.**	at Peak time					**115**
***Parking time is estimated 20 min. for Motorcycle and 30 min. for Light Vehicle.**							

Table 2-12 Calculation of the Number of Passengers and Required Scale of the Car Park (Tanzania)

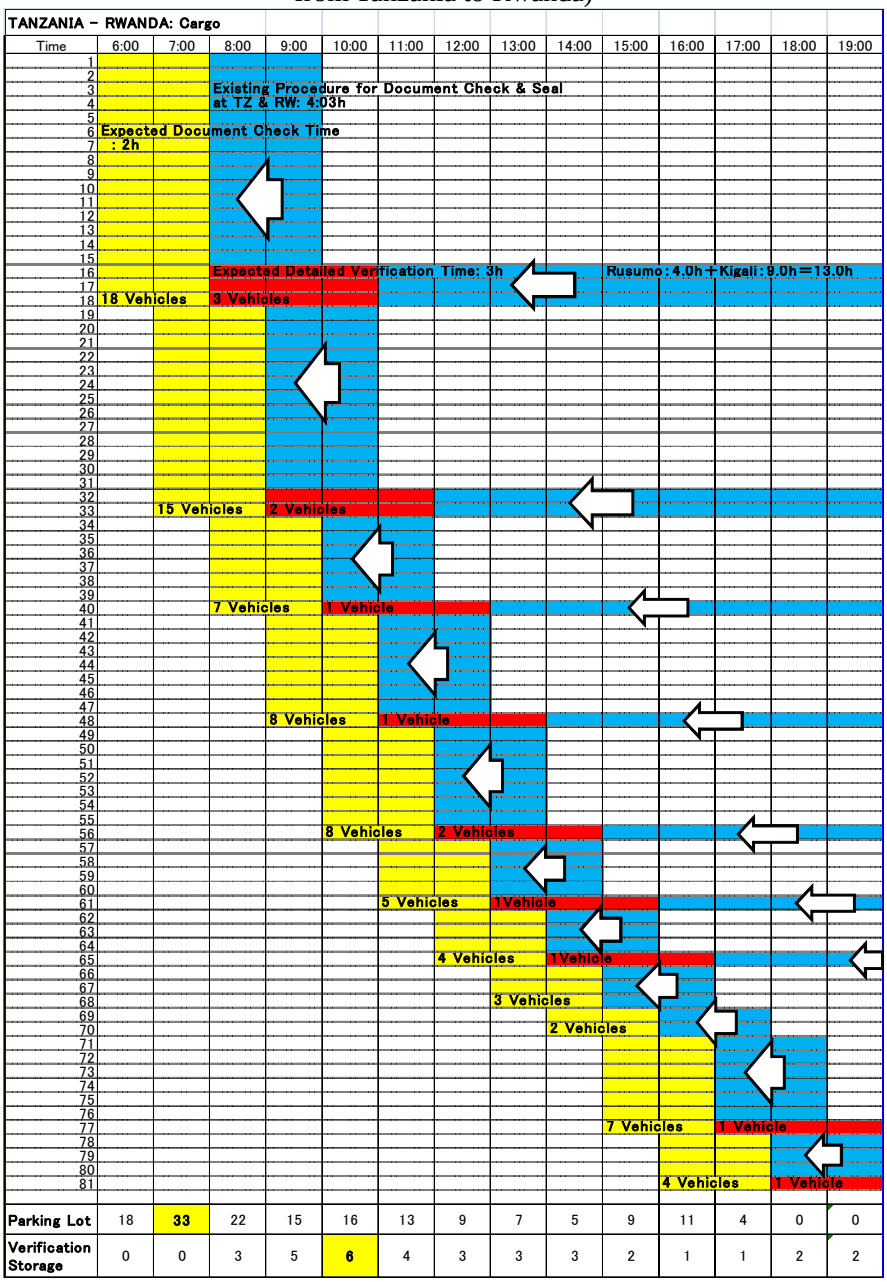
Calculation for Number of Passenger and Parking Lot

To Tanzania

			Pedestrian	Motorcycle	Light Vehicle	Heavy Vehicle	**Total**
1	**Traffic Volume in 2010**	**Average / 2 Days**		**13**	**4**	**65**	**82**
	Traffic Volume in Peak Time (Ave. 32 min.)	**/ Hour**			**4**	**36**	
	Traffic Volume for Cargo Trucks in Peak Time	**/ Hour**				**25**	
	Parking Vehicles for Truck Terminal	**RW→RW、TZ→TZ / Peak time**				**1**	**1**
	Number of Passenger in 2010	**Persons / Day**	**151**	**16**	**10**	**148**	**325**
2	**Traffic Growth from 2010 to 2015**	6% / Year	133.80%	133.8%	133.8%	133.8%	
3	**Traffic Volume in 2015**	**/ Day**		**17**	**5**	**87**	**110**
	Traffic Volume in Peak Time (Ave. 32 min.)	**/ Hour**			**5**	**48**	**54**
	Traffic Volume for Cargo Trucks in Peak Time	**/ Hour**				**33**	
4	**Number of Passenger in 2015**	**Persons / Day**	**202**	**21**	**13**	**198**	**434**
5	**Parking Vehicles**						
	Parking Vehicles for Document Check	**0:32 hours x Traffic Volume in Peak Time**			**5**	**22**	
	Detailed Verification for Red Channel	**Cargo Trucks: Transaction Time in TZ > 1hour (5.39%)**				**2**	**2**
	Parking Vehicles for Truck Terminal	**RW→RW、TZ→TZ / Peak time**				**1**	**1**
6	**Number of Passenger**	**Average of Operation Hour (12h)**	17	2	3	38	**59**
		0:32 hours: in Peak Time	6	0	12	50	**68**
		1 hours for Detailed Verification			0	4	**4**
7	**Designed Number of Parking Lot**	**Lot**			**5**	**22**	
	Designed Number of Parking Lot for Verification Storage	**Lot**				**2**	
	Designed Number of Parking Lot for Truck Terminal	**Lot**				**1**	
8	**Designed Number of Seats in Admin. Build.**	**at Peak time**					**72**

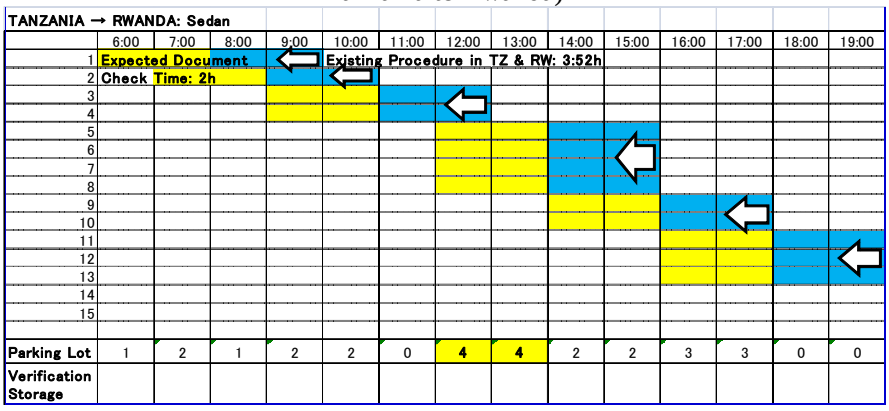
***Parking time is estimated 20 min. for Motorcycle and 30 min. for Light Vehicle.**

Table 2-13 Shortening of the Transaction Time and Required Number of Parking Lots (Cargo Trucks from Tanzania to Rwanda)



Time	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
Parking Lot	18	33	22	15	16	13	9	7	5	9	11	4	0	0
Verification Storage	0	0	3	5	6	4	3	3	3	2	1	1	2	2

Table 2-14 Shortening of the Transaction Time and Required Number of Parking Lots (Sedans from Tanzania to Rwanda)



	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
Parking Lot	1	2	1	2	2	0	4	4	2	2	3	3	0	0
Verification Storage														

Table 2-15 Shortening of the Transaction Time and Required Number of Parking Lots (Cargo Trucks from Rwanda to Tanzania)

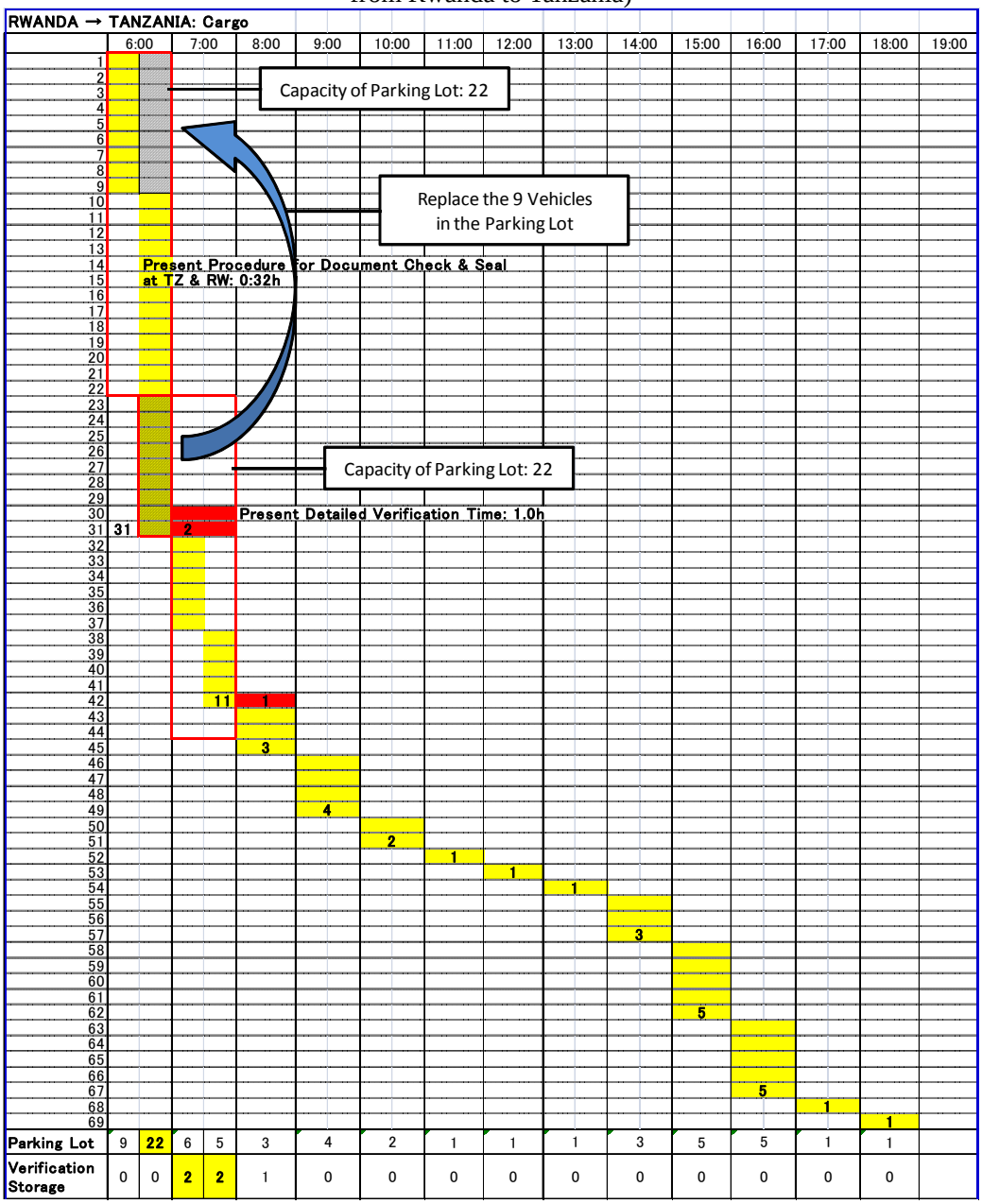
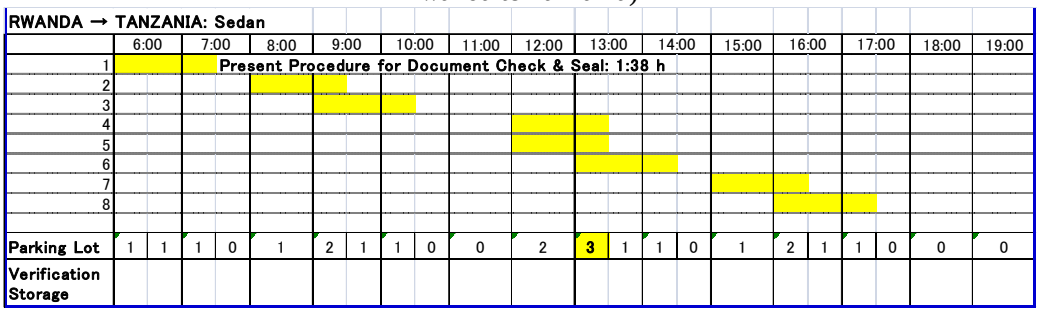


Table 2-16 Shortening of the Transaction Time and Required Number of Parking Lots (Sedans from Rwanda to Tanzania)



(4) Facility Layout Plan

The layout of the planned OSBP facilities has been decided as shown in Fig. 2-15 and Fig. 2-16 based on the number of parking lots discussed above and the processing sequence at the OSBP complex.

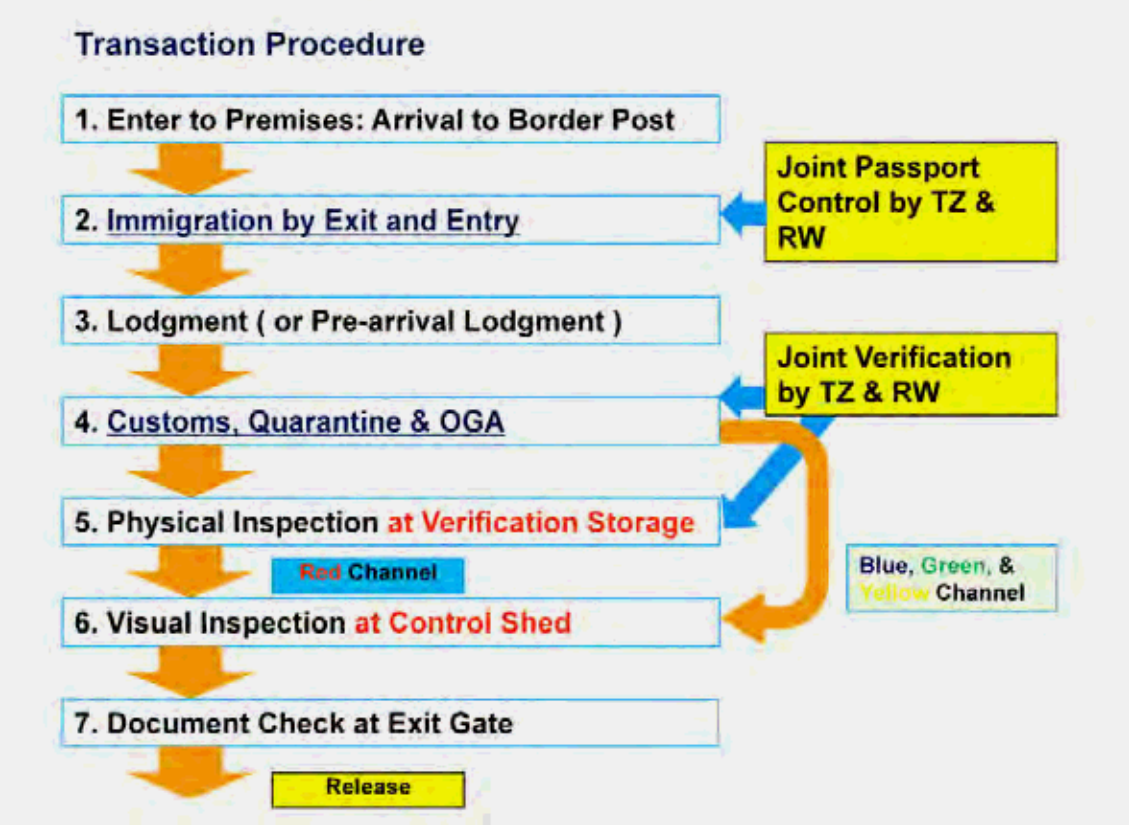


Fig. 2-15 Flowchart for transaction procedure of OSBP facilities

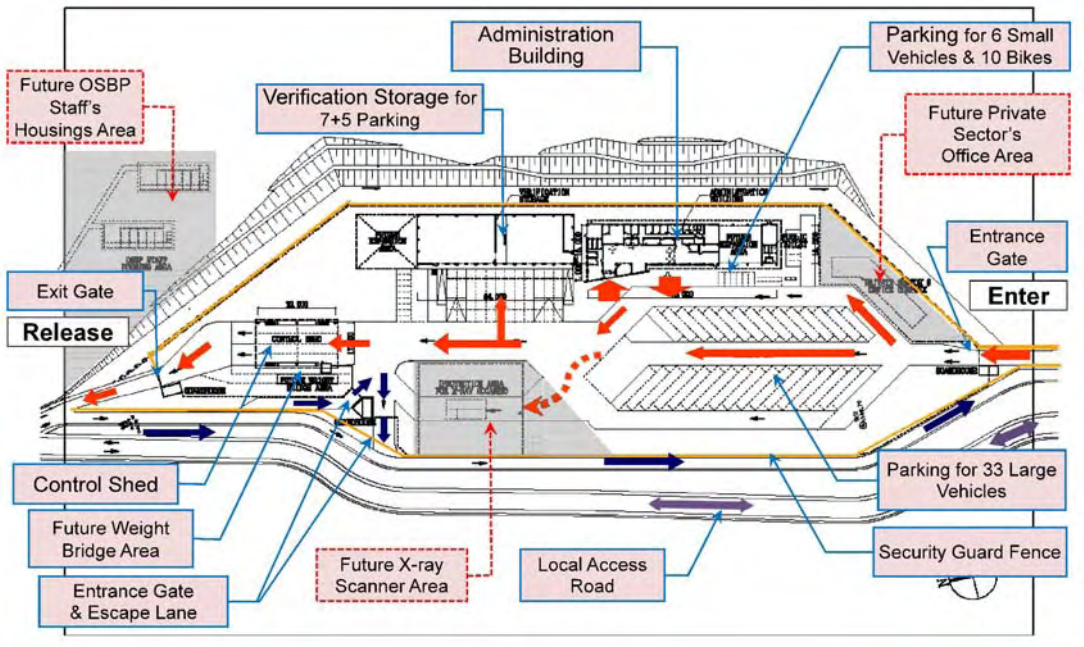


Fig. 2-16 Plan for the OSBP Complex in Rwanda

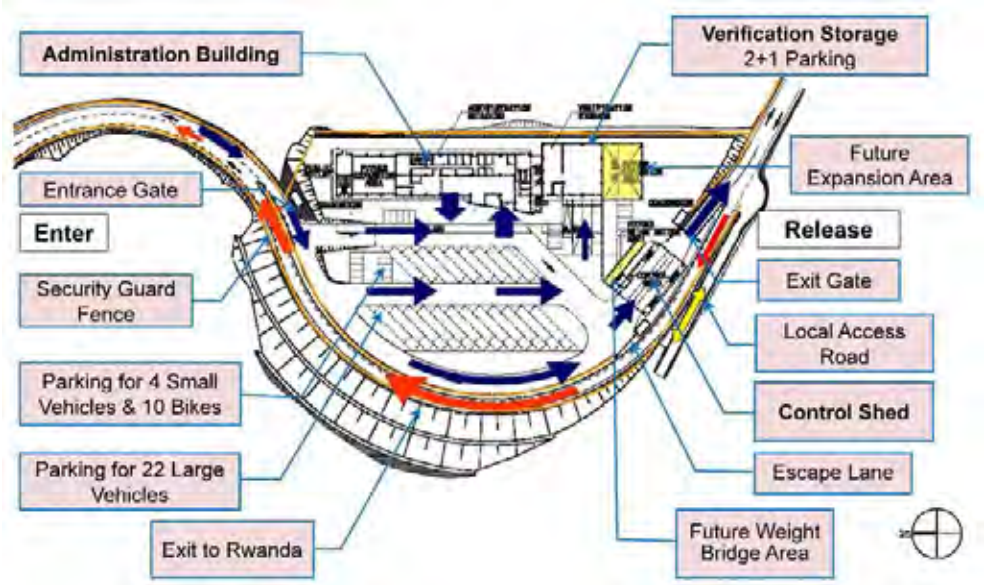


Fig. 2-17 Plan for the OSBP Complex in Tanzania

Future expansion areas for the administration building and verification storage are included in these plans. If expansion of the car park area is required in the future, it will be necessary to secure additional land. While the ground around the new OSBP premises is fairly flat in Rwanda, there is only limited extra flat space at the OSBP facility site in Tanzania. It will, therefore, be necessary to use the existing housing area for customs officers and their families for any expansion of the car park and other areas. This Grant Aid Project shall not include the construction of the future expansion plan. Fig. 2-18 shows the future expansion plan for the OSBP facility site in Tanzania.

Future plan includes the parking area for 11cars and the area for X-ray and Weight Bridge facilities. The future area of the OSBP in Tanzania will be the same scale as the area of the OSBP in Rwanda.

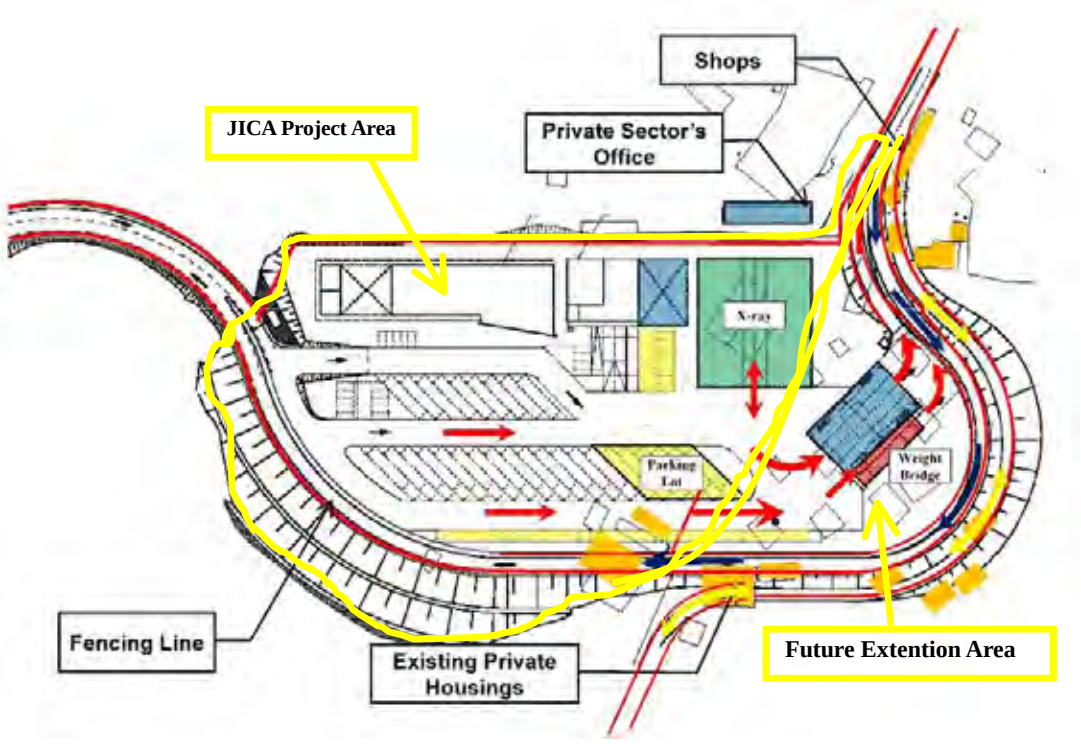


Fig. 2-18 Plan for Future Expansion of the Tanzanian OSBP Facility Site

(5) Administration Building

1) Plan

The administration building will contain the passport control, customs, police, quarantine and other departments of the two countries. To determine the size of each office, etc., the staff strength of each shift of the existing departments was used as basic data. The required number of staff of each rank in each department was then estimated, taking the expected increase of the manpower to handle the increased traffic in 2015, number of staff working for each country at the new OSBP facilities and increased staff strength resulting from the relocation of the dry port function to Rusumo into consideration in the case of Rwanda. The required floor area was then calculated based on the relevant Japanese MILT standards.

Table 2-17 Current Border Staff Strength in Rwanda and Tanzania

Calculation Reference for Number of Staff

Rwanda Officers in 2010

			Manager	Staff	Supporting Staff	Total
1	**Number of Staff (per Shift) in 2010**					
	Immigration Officers	Persons	1	3	0	4
	Customs Officers	Persons	1	2	3	6
	Customs Inspectors	Persons		2		2
	Revenue Protection Dept.	Persons		3		
	OGA: RBS: Ministry of Health, MINIAGRI: Animal Husbandry, REMA: Environment, & Health Desk	Persons	0	4	0	4
	Police Officers	Persons	1	2	0	3
	Police Guardsman	Persons		2		2
	Others	Persons				0
	Total	Persons	3	18	3	**24**
2	**Number of Staff (in Total) in 2010**					
	Immigration Officers	Persons	1	3	0	4
	Customs Officers	Persons	1	5	3	9
	Customs Inspectors	Persons		4		4
	Revenue Protection Dept.	Persons		3		3
	OGA: RBS: Ministry of Health, MINIAGRI: Animal Husbandry, REMA: Environment, & Health Desk	Persons	0	4	0	4
	Police Officers	Persons	1	7	0	8
	Police Guardsman	Persons		4		4
	Others	Persons				0
	Total	Persons	3	30	3	**36**

Tanzanian Officers in 2010

			Manager	Staff	Supporting Staff	Total
1	**Number of Staff (per Shift) in 2010**					
	Immigration Officers	Persons	1	4	3	8
	Customs Officers	Persons	1	3	2	6
	Customs Inspectors	Persons				0
	OGA: Ministry of Agriculture, Fishery & Health	Persons	0	3	0	3
	Police Officers	Persons	1	2	0	3
	Police Guardsman	Persons		1		1
	Total	Persons	3	13	5	**21**
2	**Number of Staff (in Total) in 2010**					
	Immigration Officers	Persons	1	10	3	14
	Customs Officers	Persons	1	3	2	6
	Customs Inspectors	Persons				0
	OGA: Ministry of Agriculture, Fishery & Health	Persons	0	3	0	3
	Police Officers	Persons	1	4	0	5
	Police Guardsman	Persons		2		2
	Total	Persons	3	22	5	**30**

Table 2-18 Estimated Border Staff Strength in 2015 (Rwanda)

Calculation for Number of Staff

Rwanda Officers in 2015

			Manager	Staff	Supporting Staff	Total
1	**Number of Staff in 2010**					
	Immigration Officers	Persons	1	3	0	4
	Customs Officers	Persons	1	2	3	6
	Customs Inspectors	Persons		2		2
	Revenue Protection Dept.	Persons		3		
	OGA	Persons	0	4	0	4
	Police Officers	Persons	1	2	0	3
	Police Guardsman	Persons		2		2
	Total	Persons	3	18	3	**24**
2	**Traffic Growth up to 2015**	6%/Year				**133.8%**
3	**Number of Staff in 2015**					
	Immigration Officers	133.8%	1	4	0	5
	Customs Officers	133.8%	1	3	4	8
	Customs Inspectors	400.0%		8		8
	Revenue Protection Dept.	133.8%		4		
	OGA	100.0%	0	4	0	4
	Police Officers	133.8%	1	3	0	4
	Police Guardsman	100.0%		2		2
	Total	Persons	3	28	4	**35**
4	**OSBP in Rwanda**					
	Immigration Officers	50%	1	2	0	3
	Customs Officers	70%	1	2	3	6
	Customs Inspectors	85%	0	7	0	7
	Revenue Protection Dept.	100%	0	4	0	4
	OGA	100%	0	4	0	4
	Police Officers	70%	1	2	0	3
	Police Guardsman	100%	0	2	0	2
	Total	Persons	3	23	3	**29**
5	**OSBP in Tanzania**					
	Immigration Officers	50%	1	2	0	3
	Customs Officers	30%	0	1	1	2
	Customs Inspectors	15%	0	1	0	1
	Revenue Protection Dept.	0%	0	0	0	0
	OGA	0%	0	0	0	0
	Police Officers	30%	0	1	0	1
	Police Guardsman	0%	0	0	0	0
	Total	Persons	1	5	1	**7**

Table 2-19 Estimated Border Staff Strength in 2015 (Tanzania)

Calculation for Number of Staff

Tanzanian Officers in 2015

			Manager	Staff	Supporting Staff	Total
1	**Number of Staff in 2010**					
	Immigration Officers	Persons	1	4	3	8
	Customs Officers	Persons	1	2	2	5
	Customs Inspectors	Persons		1		1
	OGA	Persons	0	3	0	3
	Police Officers	Persons	1	2	0	3
	Police Guardsman	Persons		1		1
	Total	Persons	3	13	5	**21**
2	**Traffic Growth up to 2015**	6%/Year				**133.8%**
3	**Number of Staff in 2015**					
	Immigration Officers	133.8%	1	5	4	10
	Customs Officers	133.8%	1	3	3	7
	Customs Inspectors	300.0%	0	3	0	3
	OGA	100.0%	0	3	0	3
	Police Officers	133.8%	1	3	0	4
	Police Guardsman	200.0%	0	2	0	2
	Total	Persons	3	19	7	**29**
4	**OSBP in Tanzania**					
	Immigration Officers	50%	1	3	2	6
	Customs Officers	70%	1	2	2	5
	Customs Inspectors	70%	0	2	0	2
	OGA	100%	0	3	0	3
	Police Officers	70%	1	2	0	3
	Police Guardsman	100%	0	2	0	2
	Total	Persons	3	14	4	**21**
5	**OSBP in Rwanda**					
	Immigration Officers	50%	1	3	2	6
	Customs Officers	30%	0	1	1	2
	Customs Inspectors	30%	0	1	0	1
	OGA	0%	0	0	0	0
	Police Officers	30%	0	1	0	1
	Police Guardsman	0%	0	0	0	0
	Total	Persons	1	6	3	**10**

Table 2-20 Calculation for Room Area at the OSBP Complex in Rwanda

Calculation for Room Area

Rwanda OSBP

			Manager	Staff	Supporting Staff	Total
1	**Number of Passenger**	Day				**465**
		at Peak				**115**
2	**Unit Area Basis**	m2/Person	4.0	4.0	4.0	
			6.0	1.8	1.0	
3	**Administration Building**					
	Rwanda side					
	Immigration	m2	24	14	0	38
	: Interview Rooms: 3m x 4m x 2	m2				24
	: Archive Room: 4m x 6m	m2				24
	Customs	m2	24	14	12	50
	: DTI (Data Input Trade) Rm.	m2				36
	: Equipment Room: 4m x 6m	m2				24
	: Archive Room: 4m x 6m	m2				24
	Revenue Protection Dept.	m2	0	29	0	29
	OGA	m2	0	29	0	29
	Police	m2	24	14	0	38
	: Cell: 2.5m x 4m x 4	m2				40
	Meeting Rm, etc.	m2				58
	Duty Room	m2				36
	Passenger's Area	m2				229
	Kitchen, etc.	m2				37
	Public Toilet	m2				73
	Generator Room	m2				48
	Public Area	35%/Office				145
	Sub-total					983
	Tanzania side					
	Immigration	m2	24	22	8	54
	Customs	m2	0	7	4	11
	OGA	m2	0	7	0	7
	Police	m2	0	7	0	7
	Meeting Rm, etc.	m2				20
	Public Area	35%/Office				35
	Sub-total					**134**
	Total		72	101	12	**1,117**
4	**Control Shed (Control Room)**			14		**14**
5	**Verification Storage (RW)**			58		58
	Verification Storage (TZ)			7		7
	Total (Verification Office)					**65**
6	**Guardhouse**			14		**7**

Table 2-21 Calculation for Room Area at the OSBP Complex in Tanzania

Calculation for Room Area

Tanzania OSBP

			Manager	Staff	Supporting Staff	Total
1	**Number of Passenger**	Day				**434**
		at Peak				**72**
2	**Unit Area Basis**	m2/Person	4.0	4.0	4.0	
			6.0	1.8	1.0	
3	**Administration Building**					
	Tanzania side					
	Immigration	m2	24	22	8	54
	: Interview Rooms: 3m x 4m x 2	m2				24
	: Archive Room: 4m x 6m	m2				24
	Customs	m2	24	14	8	46
	: DTI (Data Input Trade) Rm.	m2				36
	: Equipment Room: 4m x 6m	m2				24
	: Archive Room: 4m x 6m	m2				24
	OGA	m2	0	22	0	22
	Police	m2	24	14	0	38
	: Cell: 2.5m x 4m x 4					40
	Meeting Rm, etc.	m2				42
	Duty Room	m2				36
	Passenger's Area	m2				143
	Kitchen, etc.	m2				37
	Public Toilet	m2				83
	Generator Room	m2				48
	Public Area	35%/Office				131
	Sub-total					**852**
	Rwanda side					
	Immigration	m2	24	14	0	38
	Customs	m2	0	7	4	11
	Revenue Protection Dept.	m2	0	0	0	0
	OGA	m2	0	0	0	0
	Police	m2	0	7	0	7
	Meeting Rm, etc.	m2				14
	Public Area	35%/Office				25
	Sub-total					**96**
	Total		120	202	12	**947**
4	**Control Shed (Control Room)**			7		**7**
5	**Verification Storage (TZ)**			14		14
	Verification Storage (RW)			7		7
	Total (Verification Office)					**22**
6	**Guardhouse**			14		**7**

Given the basic principle of joint operation by the two countries, it is assumed that a single window service by the two countries will be provided for passport control and customs inspection. At the passport control facility, the visa application window will be separated from the passport check window. Two small rooms will be introduced for individual interviews and checking. At the customs,

there will be a cashier window as individual room in addition to a declaration and document return window.

The police office will be sited in a location from which checking at the entrance and monitoring of the car park can be easily conducted. Other offices, including the quarantine office, will be located in the customs area as their operation is closely related to the customs.

In regard to the passenger area, there will be a separate entrance and exit to create a one-directional flow line for the efficient and orderly checking of passengers without causing any congestion at each window which is currently the case.

The lobby will be used by people awaiting the issue of a visa (those concerned only), passport control and customs declaration. Handrails will be installed in the passport control area to create a single line queue to prevent confusion. Handrails for a standing queue are believed to be sufficient as the passport check does not require a long time to complete. In contrast, seats will be introduced in the customs area as some people may have to wait a long time depending on the actual contents of their customs declaration. A DTI room will also be provided in the passenger area where an agent can prepare necessary documents.

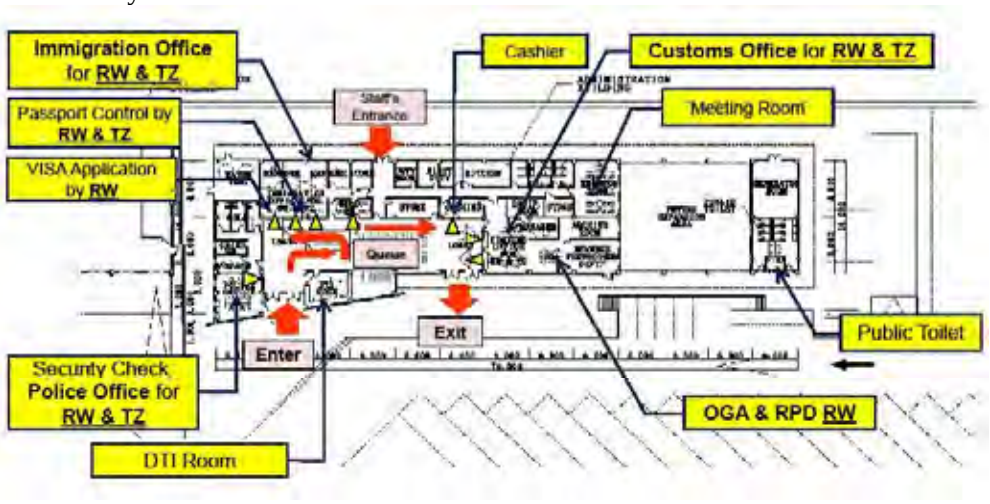


Fig. 2-19 Plan for the Administration Building in Rwanda

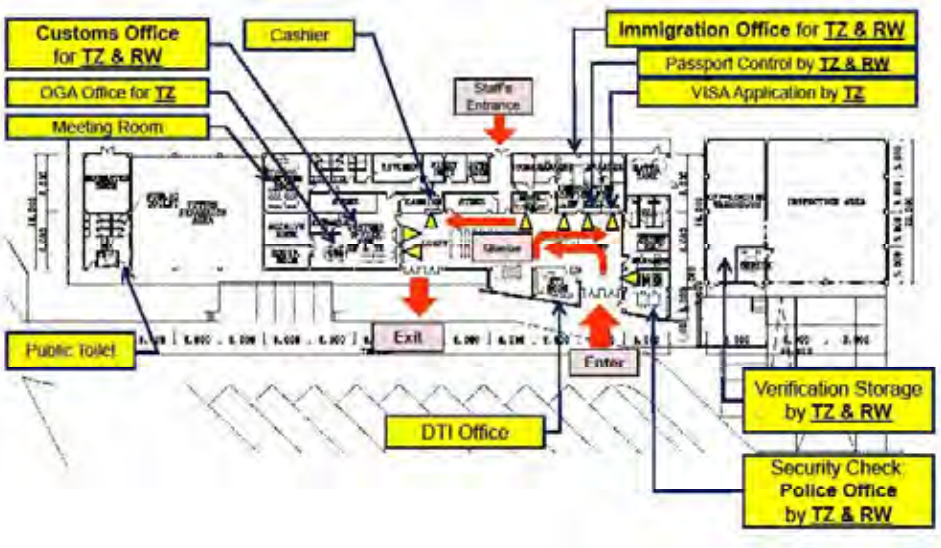


Fig. 2-20 Plan for the Administration Building in Tanzania

Public toilets and the generator room will be located away from the administration building to

avoid disturbance by sound or odour. A pent roof will be employed to collect rainwater which will be pumped to an elevated water tank after temporary storage in a rainwater tank.

2) Cross-Section

Folded steel plates will be used for the pent roof designed for the collection of rainwater in view of their ease of procurement and good rainwater collection performance. The column span will be either 6 m or 8 m and the beams will be made of reinforced concrete. Light gauge steel will be used only to support the folded steel plates. The ceiling height will be 3 m for the offices. The ceiling height of the waiting hall will be 4.5 m for good natural ventilation and lighting as many people may loiter in this area from time to time. The towerinstalled the elevated water tank will be located in a position from which the entrance to the administration building can be easily indicated.

(6) Verification Storage

1) Plan

The inspection storage and off-loading warehouse will have dimensions of 4 m in width and 20 m in depth for one parking space to provide a sufficient area for operation and parking. The off-loading warehouse will have an extra span in addition to the designed number of parking lots as cargo may require storage for up to one week. The office area for inspectors is also provided in verification storage. The manual shutters are installed for each parking lot for the case of a power cut.

2) Cross-Section

The floor height will be 1.4 m to conform to the standard deck height (1,400 - 1,500 mm) of trailer trucks. For other trucks, the ground of the parking lots will be raised to match the deck height of 0.9 m. A ramp for forklift operation will be provided at the side of parking lot. The verification storage will also have a pent roof and the collected rainwater will be stored in the rainwater tank at the administration building. Louvres will be provided above the shutters for the ventilation and lighting of the ventilation storage.

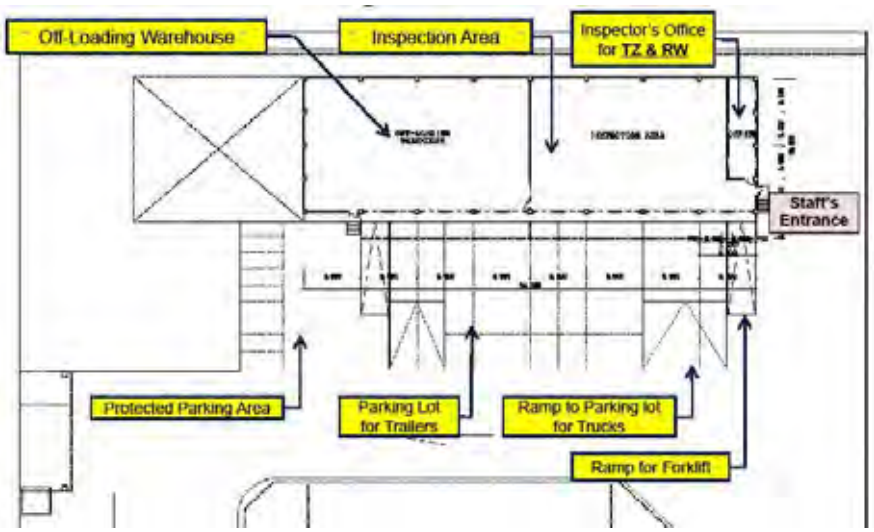


Fig. 2-21 Plan for the Verification Storage in Rwanda

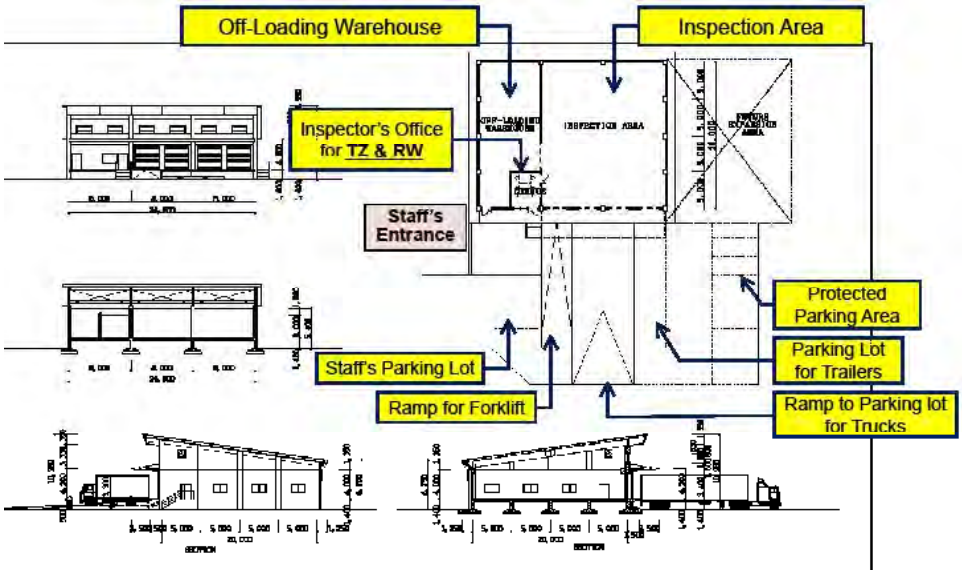


Fig. 2-22 Plan for the Verification Storage in Tanzania

(7) Control Shed

1) Plan

Vehicles which have completed the document check through the individual channels including physical verification will enter the control shed for the final procedural check and vehicle appearance check before entering the country of destination. Because of the different volumes of traffic and physical distribution, the control shed in Rwanda will have four lanes while the control shed in Tanzania will have only three lanes. Each shed will have an inspectors' office (4 m x 4 m).

2) Cross-Section

The control shed will have a height of 5.5 m where some 1 m of extra cargo height is added to the highest container height from the ground.

For the vehicle appearance check, a stage (GL +3.2 m) will be provided on both sides of the lane so that the space above a container or bus roof can be checked.

(8) Guardhouses

1) Plan

A guardhouse will be located in three places, i.e. the entry and exit points of the OSBP facilities and escape lane.

2) Cross-Section

The guardhouses will have two floor levels to serve people and trucks respectively in view of the efficient movement of people and vehicles.

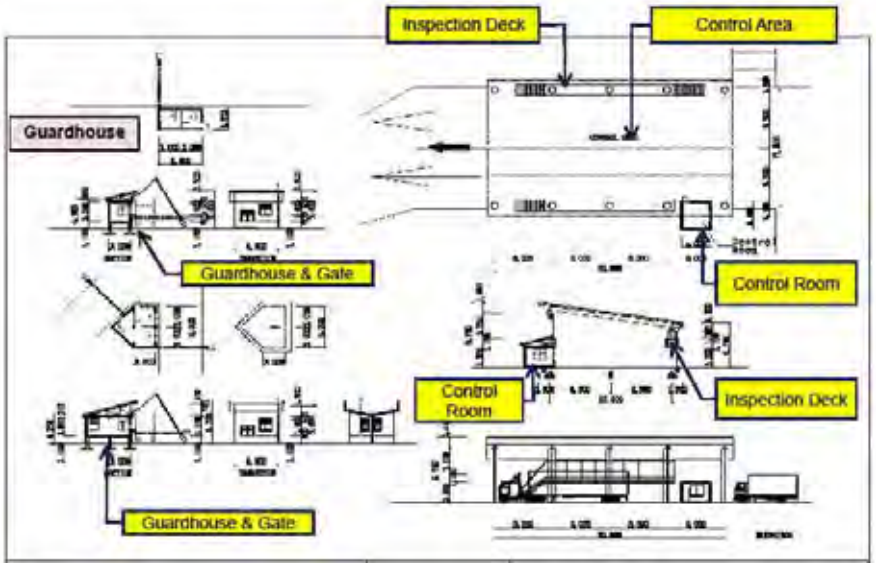


Fig. 2-23 Plan for the Guardhouses in Rwanda

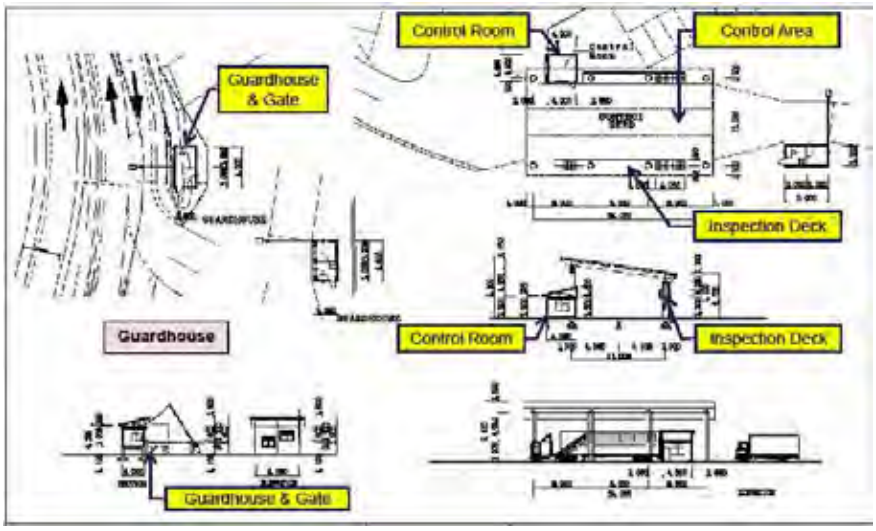


Fig. 2-24 Plan for the Guardhouses in Tanzania

(9) Structural Plan

1) Outline of the Structural Plan

The planned OSBP facilities will include an administration building (16.0m x 78.0m), verification storage (20.0 m x 64.0 m in Rwanda; 20.0 m x 24.0 m in Tanzania), control shed (17.0 m x 32.0 m in Rwanda; 13.0 m x 24.0 m in Tanzania) and guardhouses (6.0 m x 3.0 m). All of the buildings will be single story buildings.

An RC structure will be employed in consideration of local factors relating to the procurement of materials, general conditions of the construction industry, economy and construction schedule. Both the verification storage and control shed will have a pent steel roof structure on RC pillars and folded

steel plates will be used as the roofing material.

Brick masonry, which is the common wall construction method in the two countries, will be used for the external walls and internal partition walls

2) Foundation Type

A boring survey was conducted at three points on both the Rwandan and Tanzanian sides of the project area. Because the planned construction sites are located in a mountain area, there are many topographical undulations. In most cases, cutting work is required. The building foundations should, therefore, be on firm bedrock.

At boring point No. 1 in Rwanda, a silty clay formation with a N value of 5 - 20 stretches to around GL -6.0 m and bedrock with a N value of 50 or high spreads beneath this formation. As the design GL is -7.0 m from the present surface, the bottom of the foundations will rest on the bedrock.

At boring point No. 5 in Tanzania, the top 70 cm layer is made of banked soil above bedrock with a N value of 43 or higher. As the design GL is practically the same as the present surface, the bottom of the foundations will rest on the bedrock.

At present, spread foundations (independent foundations) using bedrock with a N value of 50 or higher as the bearing stratum are planned for the OSBP facilities in both countries. The design long-term allowable bearing capacity is 30.0 tons/m^2 (=300 kN/m^2).

While a slab-on-earth floor will be employed for the ground floor of the general areas of the buildings, a structural slab floor will be employed for the verification storage in view of its ground floor level of GL +1.4 m.

3) Outline of the Structural Design

For the structural design of the planned facilities under the Project, the cross-section is, in principle, calculated using the Japanese stress analysis and allowable stress method for the framework. The design external force and load used for this calculation are determined taking the local weather conditions, local seismic force and Japan's structural design standards into consideration. In principle, those values stipulated in Japan's structural design standards are used for the allowable stress for materials.

4) Live Load

Having referred to the Building Standards Act of Japan and its Enforcement Regulations, the live load values shown in Table 2-22 are used for the Project.

Table 2-22 Design Live Loads

Area	Live Load (Unit: N/m^2)		
	Floor; Collar Beam	Framework	For Calculation of Seismic Force
Roof	600	400	200
Office	2900	1800	800
Machine Room	4900	3900	2900
Storage	3900	2900	2000

Note: The live load created by heavy equipment is considered separately from this table.

- Seismic Load

According to the calculation standards in Tanzania, the local level of seismic force is approximately one-fourth of the Japanese level. In view of the seismic load adopted by other grant aid projects in neighbouring areas and the importance of the new buildings, the seismic

load for the Project is calculated using the structural standards of Japan and taking a base shear coefficient of 0.10, which is approximately half of the Japanese standard, into consideration.

- Wind Load

The wind load for the Project is also calculated using the Building Standards Act of Japan. Referring to meteorological data in Tanzania (annual wind direction and wind velocity) the reference wind velocity is set at Vo = 30.0 m/s (inland; roughness category III).

- Materials

- Concrete	:	design standard strength Fc = 21 N/mm^2
		quality standard strength Fc = 24 N/mm^2
- Reinforcing bars	:	SD345 (D ≦ 20) or equivalent
		SD295 (D ≦ 16) or equivalent
- Structural steel	:	SS400, SSC400 or equivalent

(10) Building Services

1) Plumbing Work

As the administration building in Rwanda (and Tanzania) will be provided with toilets and washbasins for staff and passengers, plumbing work will be conducted. The water for these facilities will be river water and rainwater which will be initially stored in a water tank for subsequent pumping to an elevated water tank. From this tank, water will be supplied by the gravity system to the necessary areas in the building. The waste water discharge system inside and outside the building will combine foul water and miscellaneous waste water. Sewage will firstly be fed to an outdoor septic tank for treatment. The treated sewage will then be discharged to a leach field for infiltration to the ground.
Fire extinguishers will be provided for the administration building and verification storage.

2) Air-Conditioning and Ventilation System

The project area is situated in the tropical climate zone and both the temperature and relative humidity are high throughout the year. The outside air conditions for the air-conditioning system design of the ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) are used for the Project as these conditions are widely used as the reference outside air conditions for air-conditioning.

Cooling season	:	dry bulb temperature: 32°C
		wet bulb temperature: 27°C
		average temperature change: 7°C
Heating season	:	dry bulb temperature: 18°C

(ASHRAE Fundamentals 1997: at Dar es Salaam)

Given the local meteorological conditions, it has been decided to install an air-conditioning system in those offices where officers involved in customs clearance work are deployed. A split type independent air-conditioning system for cooling only will be installed in view of its ease of operation/maintenance and high energy efficiency.

Ceiling fans will be involved in the lobby and waiting hall to avoid a large maintenance cost for air-conditioning because of the high ceiling.

Table 2-23 Design Room Temperature

Building	Area	Design Room Temperature	
		Cooling Season	Heating Season
Administration Building	Customs; passport control; police; offices	26□	—
〃	Meeting room	26□	—
Verification Storage	Office	26□	—

A mechanical ventilation fan will be installed in the staff kitchen and toilets in the administration building to discharge bad odour and humidity. This type of fan will also be installed in the generator room and other areas where equipment which is installed or used releases heat. Table 2-24 shows the ventilation standards for different areas.

Table 2-24 Ventilation System

Building	Area	Ventilation System	Ventilation Rate	Notes
Administration Building	Kitchen	Exhaust only	≧ 10 times/hr	Ceiling fan
	Storage	"	≧ 5 times/hr	"
	Shower room	"	≧ 5 times/hr	"
	Toilets	"	≧ 10 times/hr	"
	Generator room	"	≧ 10 times/hr	Pressure fan
Verification Storage	Storage	"	≧ 5 times/hr	"

3) Electrical Installations

3-1) Power Receiving System

At present, no local commercial power supply is available for the existing border post facilities and the power needs of these facilities are met by a photovoltaic power generation system and batteries. In Rwanda, the work to extend the commercial power supply line to the area are going to be completed by the end of 2012 and connected to Tanzanian side.

It is, therefore, assumed that low voltage power supply will be available at the new OSBP facilities in both countries by the time of the completion of their construction work and an incoming panel will be installed to receive low voltage, three phase, four wire power supply (380 V/220 V, 50 Hz). A watt hour meter will be installed at this panel to measure the overall power consumption.

A watt hour meter will also be installed at the lighting power panel in each zone of the OSBP facilities to measure the power consumption in each zone.

The estimated equipment load of the new facilities is listed below.

① New OSBP Facilities in Rwanda

Load Category	Capacity	Demand Factor	Maximum Demand
Lighting	24.3 KVA	0.9	21.9 KW
Power sockets	20.45 KVA	0.3	6.1 KW
Air-conditioning	16.3 KVA	0.8	13.0 KW
Other	36.0 KVA	0.5	18.0 KW
Total	97.05 KVA	-	59.0 KW

② New OSBP Facilities in Tanzania

Load Category	Capacity	Demand Factor	Maximum Demand
Lighting	55.6 KVA	0.7	38.9 KW
Power sockets	15.9 KVA	0.3	4.8 KW
Air-conditioning	22.9 KVA	0.8	19.9 KW
Other	34.4 KVA	0.2	6.9 KW
Total	128.8 KVA	-	70.5 KW

3-2）Emergency Generator

As the stability of future power supply (in terms of the frequency and duration of power failures) is currently unknown, a diesel power generator will be installed at both OSBP facility sites to ensure the continual operation of the facilities at the time of a power failure. The target equipment and systems for back-up power supply will be the office lighting system, IT equipment and communication equipment for administration building in addition to the indoor lighting system and IT equipment of the verification storage.

Generator Capacity

- Tanzania : diesel power generator (one unit)
  hree phase, three wire, 380 V; 50 Hz; 80 KVA
- Rwanda : diesel power generator (one unit)
  three phase, three wire, 380 V; 50 Hz; 80 KVA

The installation of an uninterrupted power supply system (UPS) will be considered for individual IT or communication equipment which is particularly sensitive to voltage fluctuations and instantaneous power failure.

3-3）Lighting System

For general lighting, the use of fluorescent lamps is planned in view of the lower running and maintenance cost than other types of lamps. The design illuminance (general illuminance) for each area/room is shown in Table 2-25. These illuminance values are based on the average illuminance of the relevant international and JIS standards and taking the current local conditions in Rwanda and Tanzania into consideration.

Table 2-25 Design Illuminance by Room

Type of Room	Design Illuminance
Monitoring room	300 lux
Office	300 lux
Waiting room	200 lux
Storage	100 lux
Power/machine room	100 lux
Toilets	100 lux

In principle, switching operation for lighting will be conducted in each room as a unit. The circuit will be suitably divided to allow switching in small compartmented areas. Power supply to lighting fixtures apparatus and power sockets will be single phase, two wire, 220 V. The installation of guide lighting is planned along the evacuation ruite if such installation is considered to be necessary.

3-4）Telephone and LAN Systems

For internal communication between rooms, a private branch exchange (PBX) system comprising an IP exchange and IP phones will be installed at the OSBP facilities in both countries. These two PBX will be connected to each other to enable internal telephone communication between the two sites. In the case of a local area network (LAN) consisting of a server, switching hub, information outlets and others, each OSBP complex will have its own independent LAN. However, a

terminal for the border control system of one country will be installed at the OSBP complex of the other country so that the system of each country can be accessed from the system of the other country.

Because of the need to connect two PBX and to install a terminal of the border control system of each country at the OSBP complex of the other country, optical cables will be used for these connections for a speedy and reliable performance. Given the absence of a plan to install a fixed line telephone service at both OSBP complexes, it is assumed that information communication, including the use of the Internet, will use satellite (VSAT) connection. Actual external communication will, therefore, use a parabolic antenna, receiver/transmitter and router to be supplied by a commercial provider.

3-5）PA System

Speakers for the public address (PA) system will be installed along the corridors and in the main rooms of the administration building. The amplifier for the system will be located in the office to operate the PA system covering the entire building.

3-6）Distress Display System in Disabled Toilets

A distress display system is planned for the disabled toilets so that staff can quickly respond to a call for help by a distressed disabled person inside.

3-7）Fire Alarm System

Fire alarm transmitters, bells and indicators will be installed in strategic places to report a fire as quickly as possible to allow swift evacuation. The situation will be monitored by a control panel to be installed in the office.

3-8）Lightning Protection System

To avoid lightning damage, a lightning protection system will be installed at the OSBP facilities in both countries. The installation of an arrester is planned for individual incoming panels and distribution panels to protect this equipment from a lightning surge at an appropriate level for each equipment.

（11） Construction Materials Plan

The use of only limited types of finishing materials is planned in view of the rationalisation of procurement, construction and maintenance. The basic materials are ceramic tiles for the floors, bricks for the walls (with a mortar and paint finish), integrated ceiling system using acoustic rock wool boards (calcium silicate boards in some parts) for the ceilings and galvalium steel sheets and insulating material for the roofs. A T-bar type of exposed ceiling system (60 cm x 60 cm) is popularly used in the area. Galvalium steel sheets are selected as the roofing material because of their availability in the local market in Rwanda and Tanzania and also because of the better waterproofing performance, better workability and lighter weight than roof tiles and better durability than zinc plate steel sheets.

1） Exterior Finish

Administration Building		
Roof 1		Folded plates: galvalium steel sheet t = 0.53 mm No painting but with insulating material (glass wool t = 30 mm) Wire mesh 100 mm x 100 mm x 6 mm
Roof 2		Heat insulation (urethane foam t = 30 mm Rise: aluminium clamp
External Walls	Rises	Exposed concrete finish
	Walls	Mortar t = 20 mm + acrylic resin paint finish
Doors and Windows		Steel doors; aluminium window frames
Others	Floors	Concrete and trowel finish
	Fascias	LSG base; zinc-plated steel sheet panels with acrylic resin paint finish t = 0.8 mm
	Gutters	Box gutter: zinc-plated steel with acrylic resin paint finish t = 0.8 mm Down pipes: PVC ∅100 mm; gutters PVC ∅200 mm with stainless steel fittings

Verification Storage		
Roof 1		Folded plates: galvalium steel sheet t = 0.53 mm No painting but with insulating material (glass wool t = 30 mm) Wire mesh 100 mm x 100 mm x 6 mm
External Walls	Rises	Exposed concrete finish
	Walls	Mortar t = 20 mm + acrylic resin paint finish
Doors and Windows		Steel doors; aluminium window frames
Others	Floors	Concrete and trowel finish
	Fascias	LSG base; zinc-plated steel sheet panels with acrylic resin paint finish t = 0.8 mm
	Gutters	Box gutter: zinc-plated steel with acrylic resin paint finish t = 0.8 mm Down pipes: PVC ∅100 mm; gutters PVC ∅200 mm with stainless steel fittings
	Handrails	Stainless pipe ∅40 mm; posts: stainless FB-50 x 6

Control Shed		
Roof 1		Folded plates: galvalium steel sheet t = 0.53 mm No painting
External Walls	Rises	Exposed concrete finish
	Walls	Mortar t = 20 mm + acrylic resin paint finish
Doors and Windows		Steel doors; aluminium window frames
Others	Floors	Concrete and trowel finish
	Fascias	LSG base; zinc-plated steel sheet panels with acrylic resin paint finish t = 0.8 mm
	Gutters	Box gutter: zinc-plated steel with acrylic resin paint finish t = 0.8 mm Down pipes: PVC ∅100 mm; gutters PVC ∅200 mm with stainless steel fittings

Guardhouse		
Roof 1		Folded plates: galvalium steel sheet t = 0.53 mm No painting but with insulating material (glass wool t = 30 mm) Wire mesh 100 mm x 100 mm x 6 mm
External Walls	Rises	Exposed concrete finish
	Walls	Mortar t = 20 mm + acrylic resin paint finish
Doors and Windows		Steel doors; aluminium window frames
Others	Floors	Concrete and trowel finish
	Fascias	LSG base; zinc-plated steel sheet panels with acrylic resin paint finish t = 0.8 mm
	Gutters	Box gutter: zinc-plated steel with acrylic resin paint finish t = 0.8 mm Down pipes: PVC ∅100 mm; gutters PVC ∅200 mm with stainless steel fittings

2） Interior Finish

Administration Building

Area/Room	Floor	Base	Walls	Ceiling	Others
Waiting Hall	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rock wool acoustic boards t = 12	Handrails
Office Room	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rock wool acoustic boards t = 12	Counter
Meeting Room	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rock wool acoustic boards t = 12	-
Toilet	Ceramic tiles 200 x 200 x 6		Ceramic tiles 200 x 200 x 6	Calcium silicate boards t = 6 AEP	Vanity mirror; counter
Store	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rock wool acoustic boards t = 12	-

Verification Storage

Area/Room	Floor	Base	Walls	Ceiling	Others
Inspection Area	Concrete with trowel finish	Mortar with trowel finish t = 100	Mortar with trowel finish; acrylic resin paint	-	-
Off-Loading Warehouse	Concrete with trowel finish	Mortar with trowel finish t = 100	Mortar with trowel finish; acrylic resin paint	-	-
Office	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rockwood acoustic boards t = 12	-

Control Shed

Area/Room	Floor	Base	Walls	Ceiling	Others
Control Room	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	System ceiling 600 x 600 Rockwood acoustic boards t = 12	Handrails
Inspection Deck	Concrete with trowel finish	Mortar with trowel finish H = 100	Mortar with trowel finish; acrylic resin paint	-	-

Guardhouse

Area/Room	Floor	Base	Walls	Ceiling	Others
Guardhouse	Ceramic tiles 300 x 300 x 7	Ceramic tiles H = 100	Mortar with trowel finish; acrylic resin paint	Calcium silicate boards t = 6 AEP	-

(12) Equipment Plan

1) Outline

Table 2-26 lists the range of equipment to be provided under the Project. While the same types of equipment will be provided for both countries, the quantities differ to reflect the different sizes of the facilities in the two countries.

Table 2-26 List of Equipment to be Provided

Category	Equipment
Provided	PCs and other peripherals; generator; forklift; international telephone line system connecting the two countries
Not Provided	Weighbridge; X-ray scanner; CCTV system; radio transmitter; passenger car

2) Rational for Each Type of Equipment

The rationale to provide or not to provide certain types of equipment under the Project is explained below.

a) Generator

Rusumo is some 140 km from Kigali, the capital of Rwanda, and it is expected that power supply to the area will be provided by Rwanda Electricity Corporation in time for the implementation of the Project. The fact that power cuts frequently occur, even in Kigali, suggests that power cuts can happen at Rusumo. Because of the long transmission line, any work to locate and repair a fault may well take a longer time compared to the capital region. For this reason, it has been decided to provide a generator capable of maintaining minimum operation at the time of a power cut.

The planned range of equipment, etc. to be covered by this generator includes PCs and other OA equipment and the office lighting system in the administration building as well as the verification storage.

Outside lighting systems for the bridge, bypass road and car park are not included in back-up scope of this generator, neither are the air-conditioning systems for the administration building and verification storage. The planned generator is a diesel engine generator which is superior to a petrol engine generator in terms of the safety of fuel supply, transportation, storage and fuel cost even though it is slightly heavier and larger than a petrol engine generator. The smaller number of parts of a diesel engine generator means a better maintenance prospect due to less frequent breakdowns.

b) PCs and Peripherals

Business PCs and printers will be provided for the immigration, customs and police offices in both countries. While basic OS software and anti-virus software will be provided as essential PC systems, the application software for immigration and customs clearance must be purchased and installed by each country at its own expense. As the PCs currently used will be six years old or more by the time of the implementation of the Project, their renewal under the Project is judged to be appropriate. The number of new PCs to be provided will match the number of day-time staff members, excluding support staff, regardless of the number of PCs currently in use.

c) Forklift

At present, the physical unpacking of cargo for verification is conducted for most cargo at the dry port in Kigali and a forklift is not currently used for customs clearance work at Rusumo. In contrast, a forklift is used for cargo inspection and storage at the dry port in Kigali. As the dry port function of the actual checking of cargo will be mainly transferred from Kigali to Rusumo after the completion of the Project, a forklift will be provided under the Project. On the Tanzanian side, cargo inspection and transfer are manually conducted. In view of the level of the likely demand, one forklift each will be provided for the verification storage in both Rwanda and Tanzania.

d) Communication Line

An internal telephone line network will be installed between the OSBP complexes in the two countries. This line will enable voice and LAN communication between the two complexes. To be more precise, the border post staff members of one country will be able to talk to their colleagues and operate the PC terminals of the LAN installed in the complex of the other country.

e) Internal Telephone Line

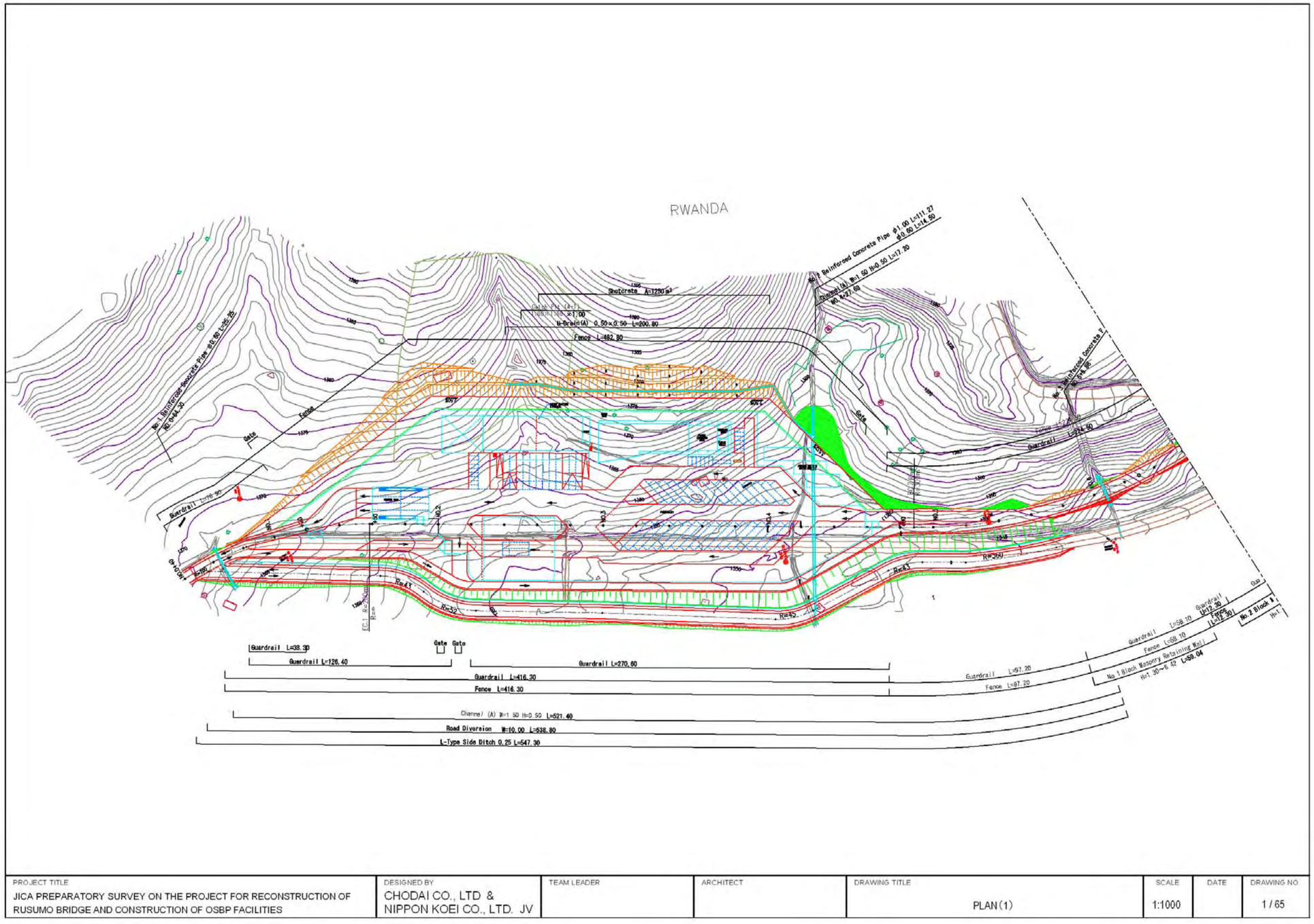
An internal telephone line system will be installed to allow the staff members of one country to talk to each other and those of the other country through extensions. A communication cable will be laid to

connect the OSBP complexes in both countries and the connected exchanges will allow cross-border extension calls.

2-2-3 Outline Design Drawing

2-2-3-1 Road

(1) Plans



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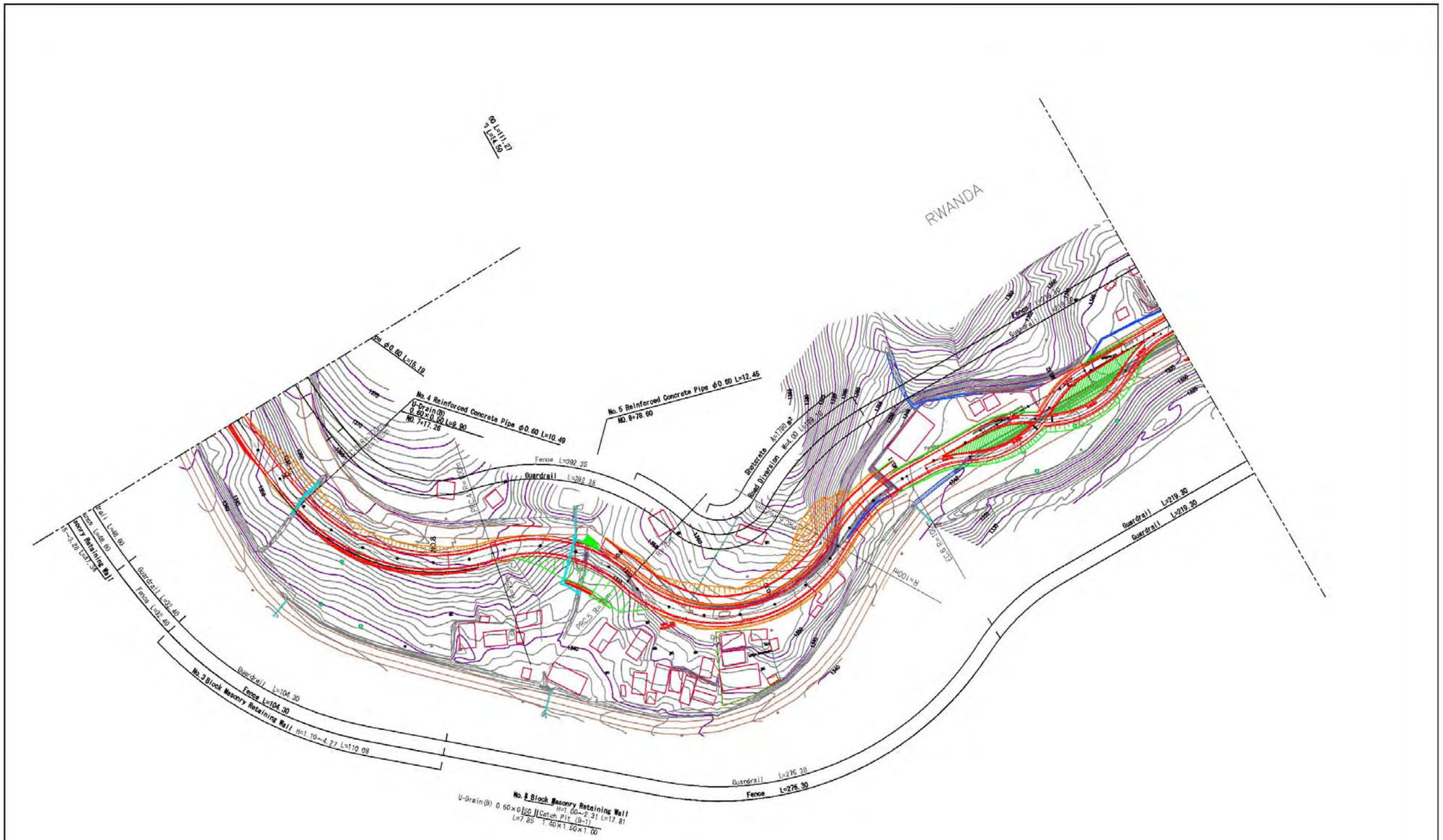
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV			PLAN (1)	1:1000		1 / 65



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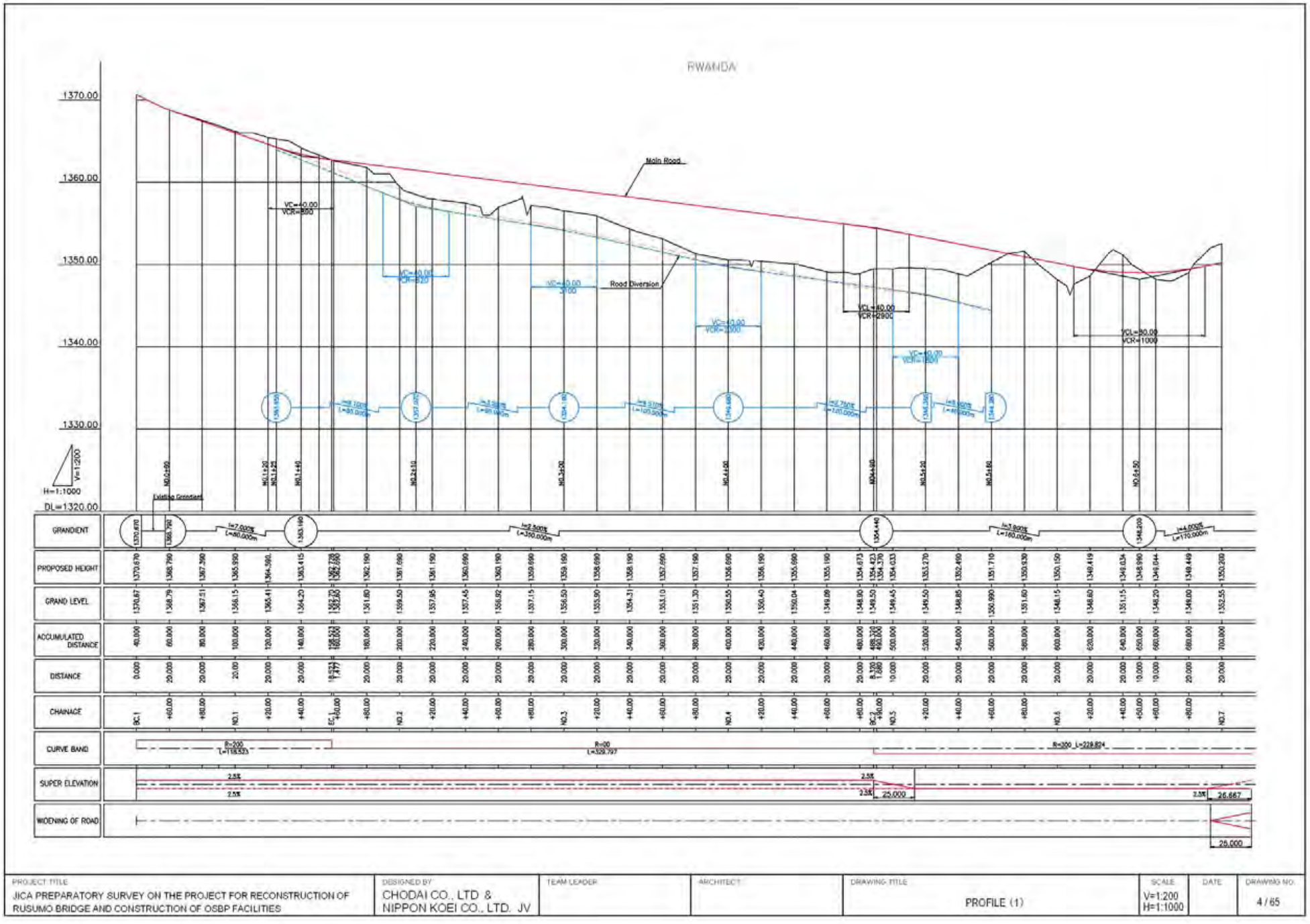
(2) Elevation


RWANDA
Main Road
Road Diversion
1370.00
1360.00
1350.00
1340.00
1330.00
H=1:1000
V=1:200
DL=1320.00
Existing Grondient
GRANDIENT
PROPOSED HEIGHT
GRAND LEVEL
ACCUMULATED DISTANCE
DISTANCE
CHAINAGE
CURVE BAND
SUPER ELEVATION
WIDENING OF ROAD
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R=00 L=529.797
R=300 L=229.824
25.000
26.667
26.000
PROJECT TITLE
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES
DESIGNED BY
CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV
TEAM LEADER
ARCHITECT
DRAWING TITLE
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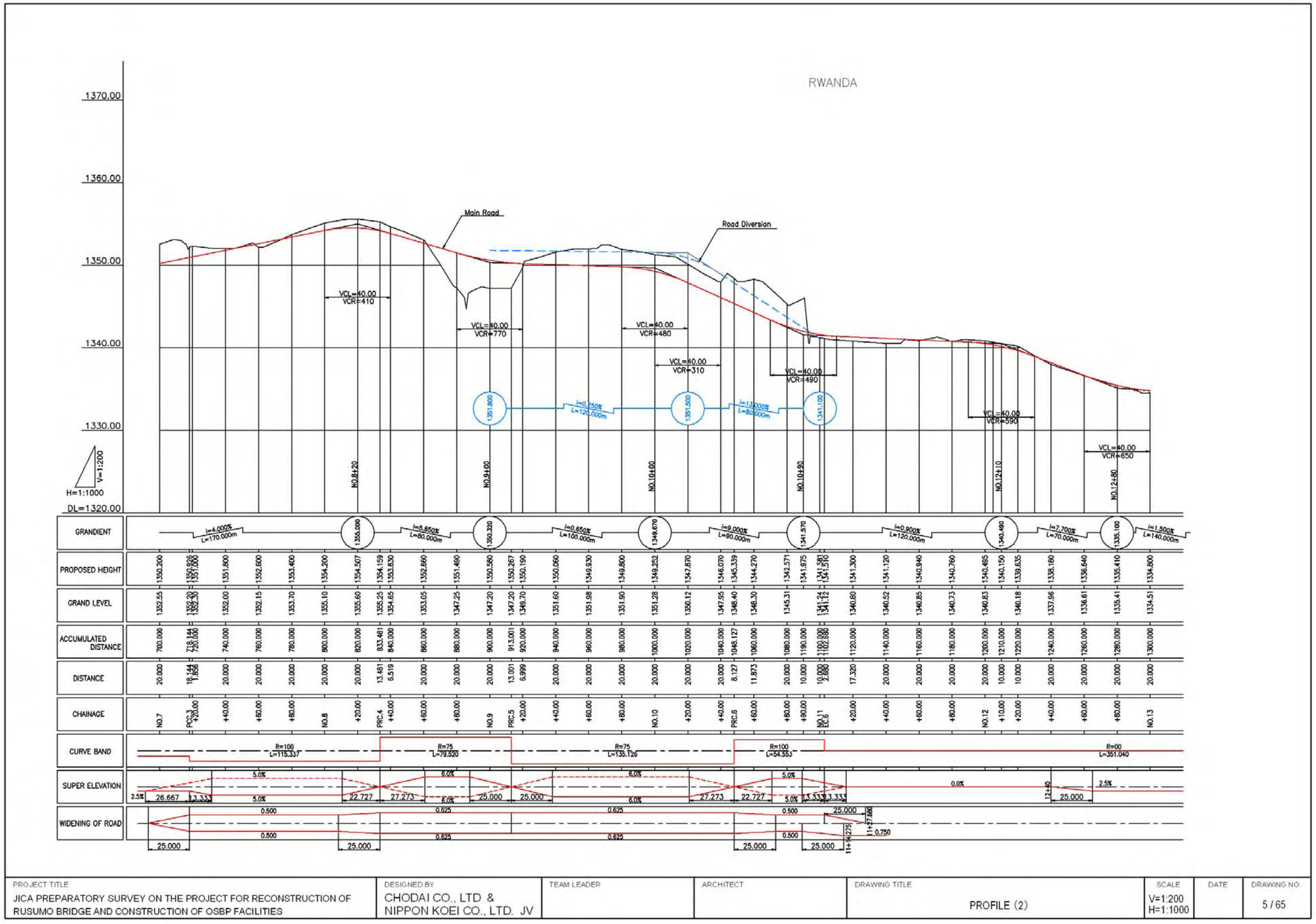

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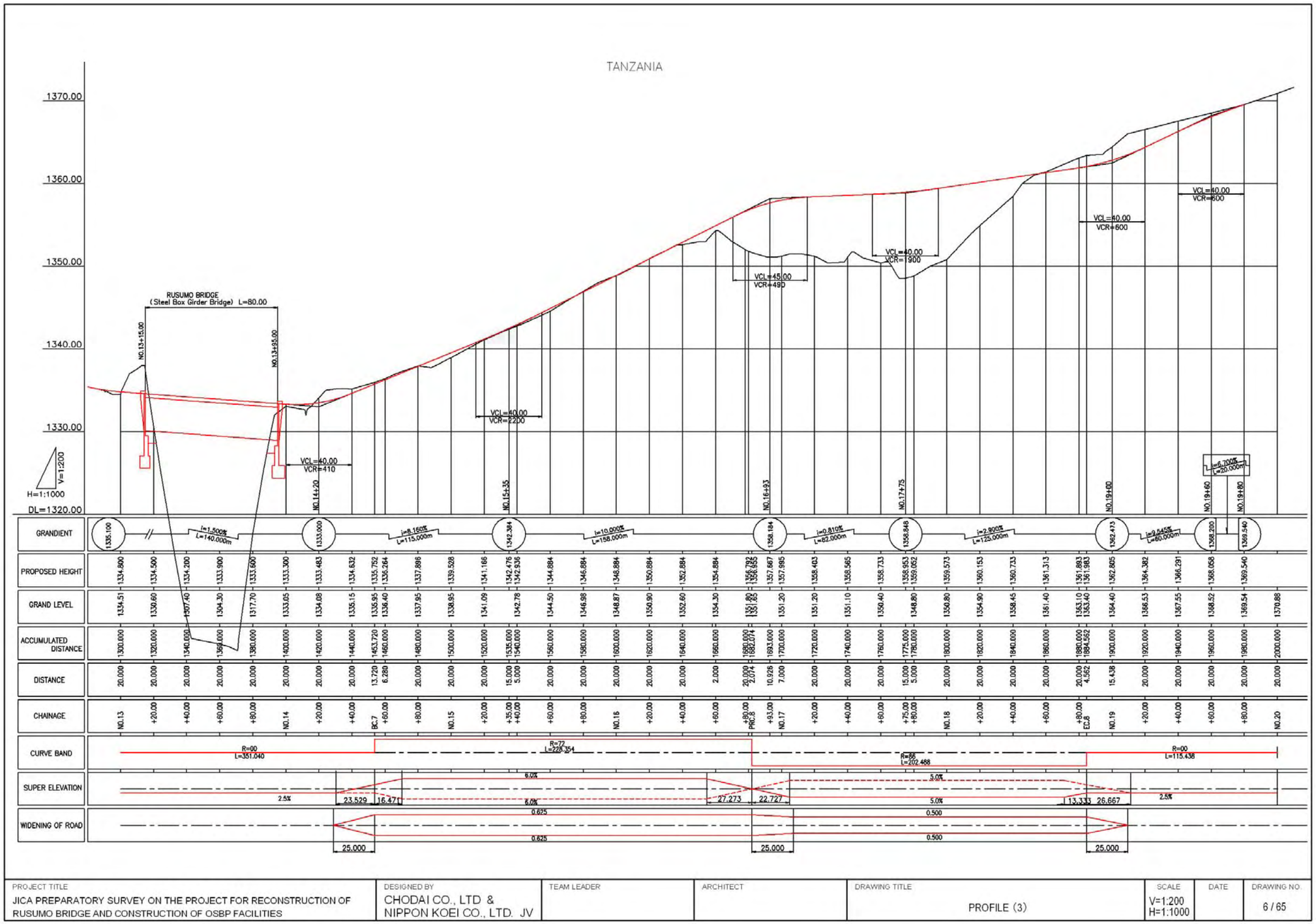

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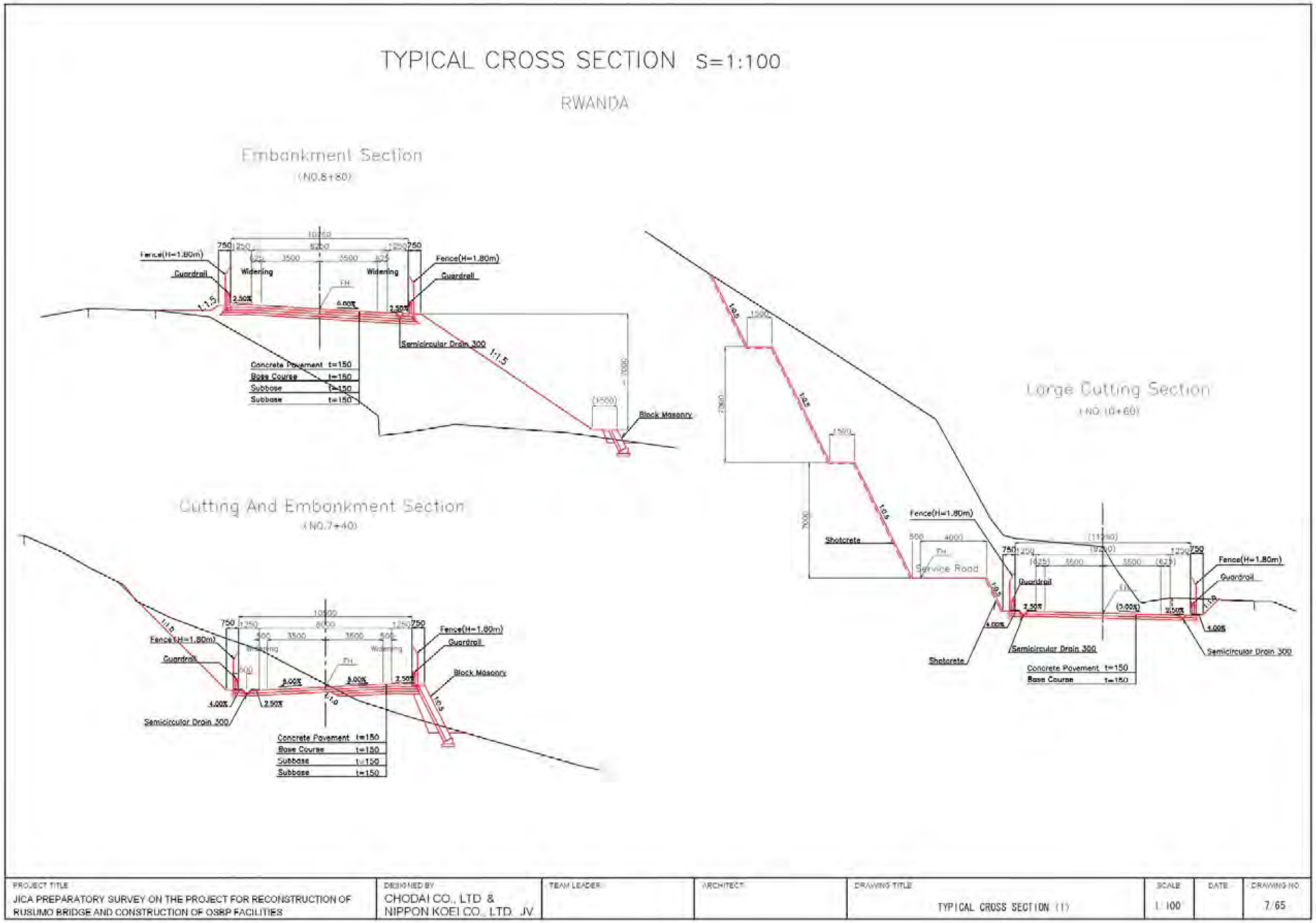
(3) Typical Cross-Sections

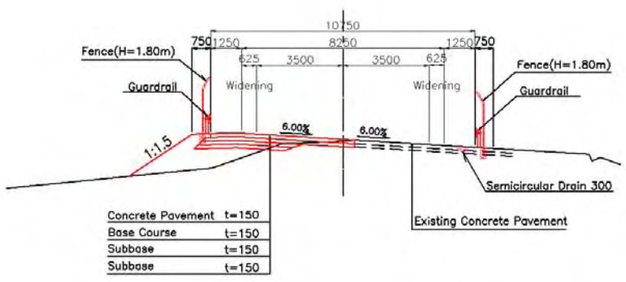


TYPICAL CROSS SECTION(2) S=1:100

TANZANIA

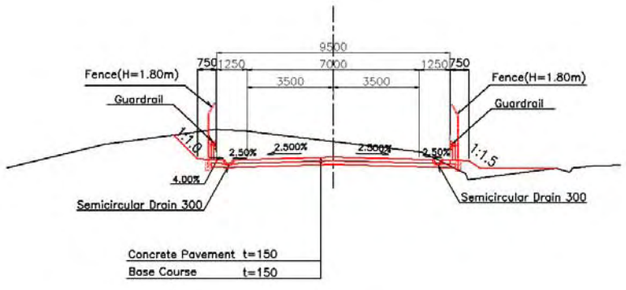
Increment Of Width At Curves Section

(NO.15+20)



Straight Section

(NO.14+40)



Reinforced Embankment Section

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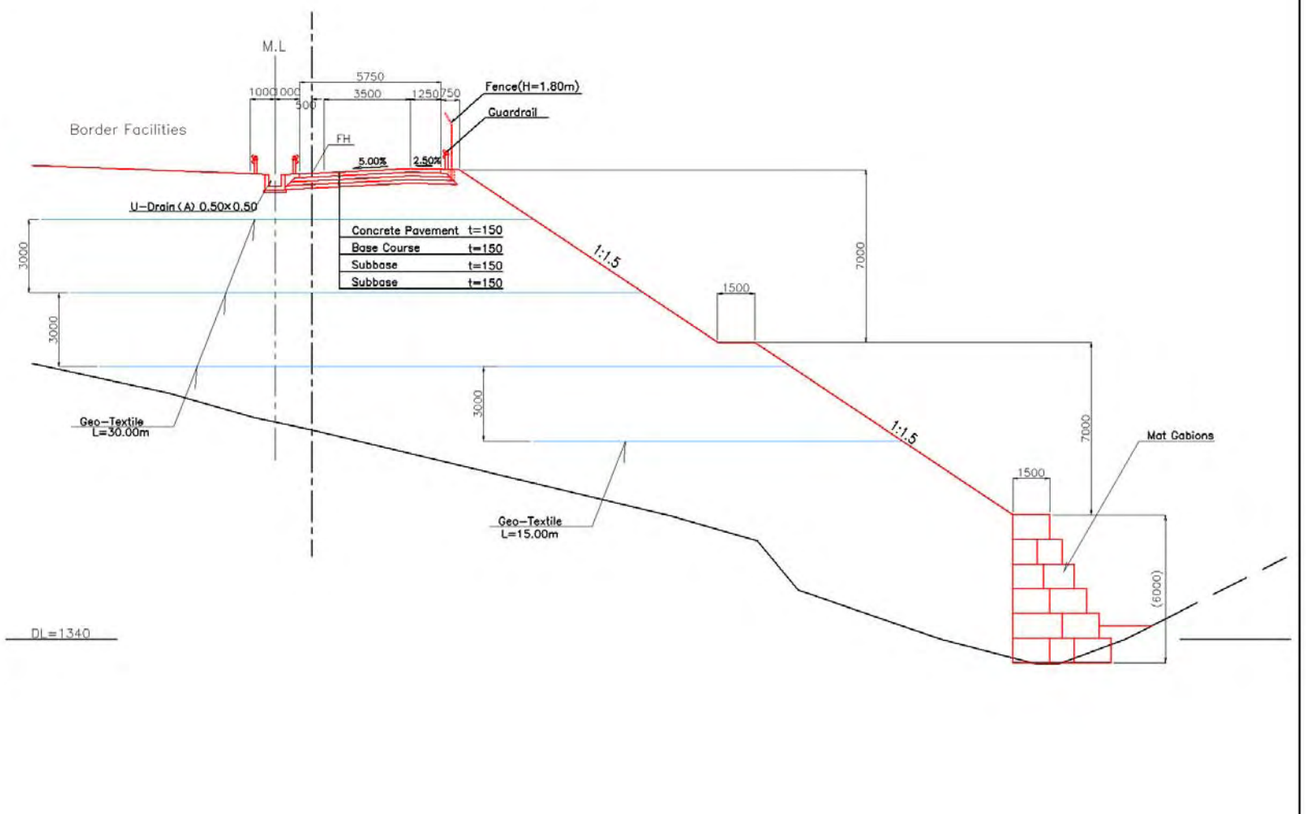

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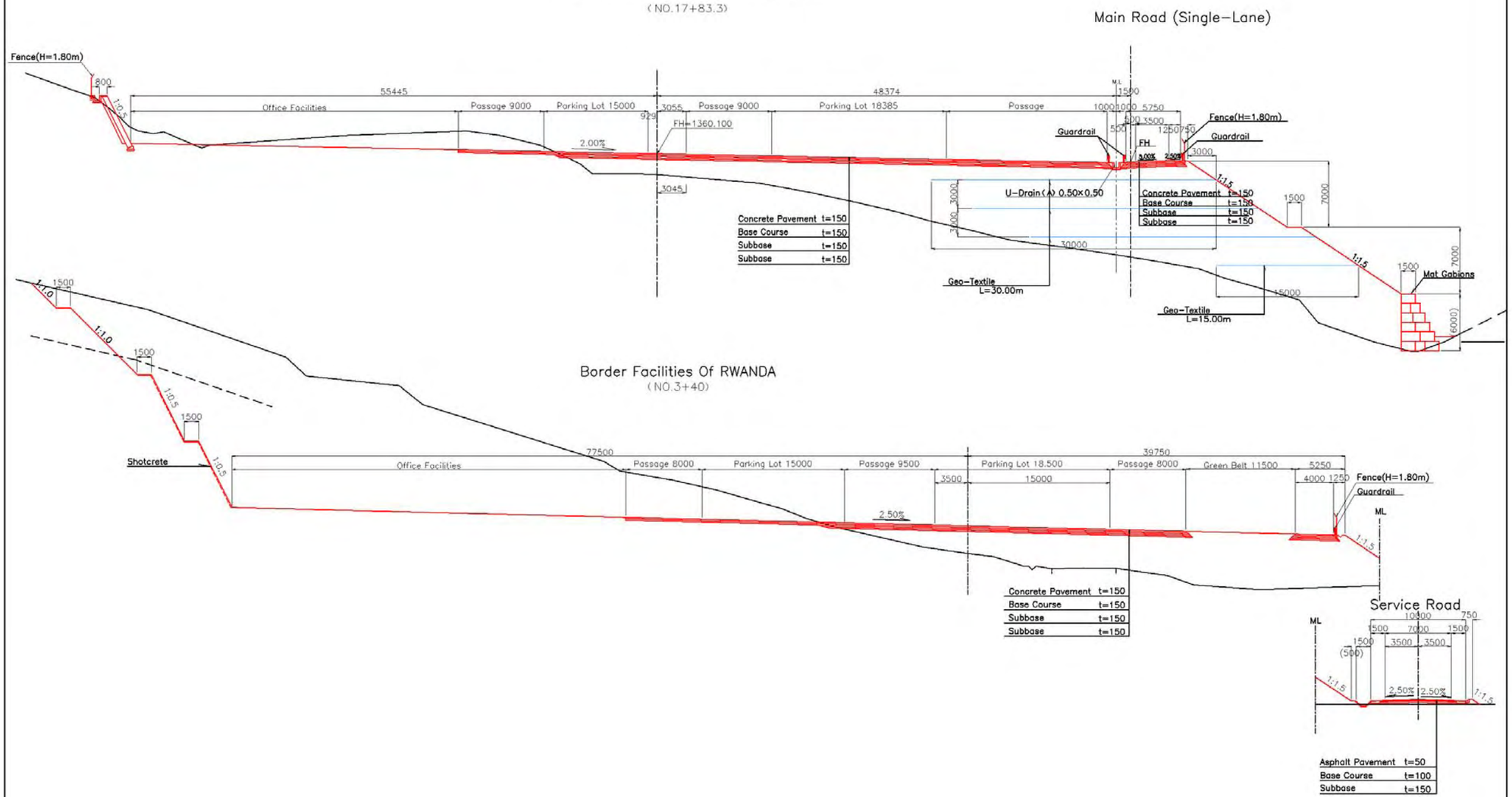
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV			TYPICAL CROSS SECTION (2)	1:100		8/65

TYPICAL CROSS SECTION S=1:200

Border Facilities Of TANZANIA

(NO.17+83.3)



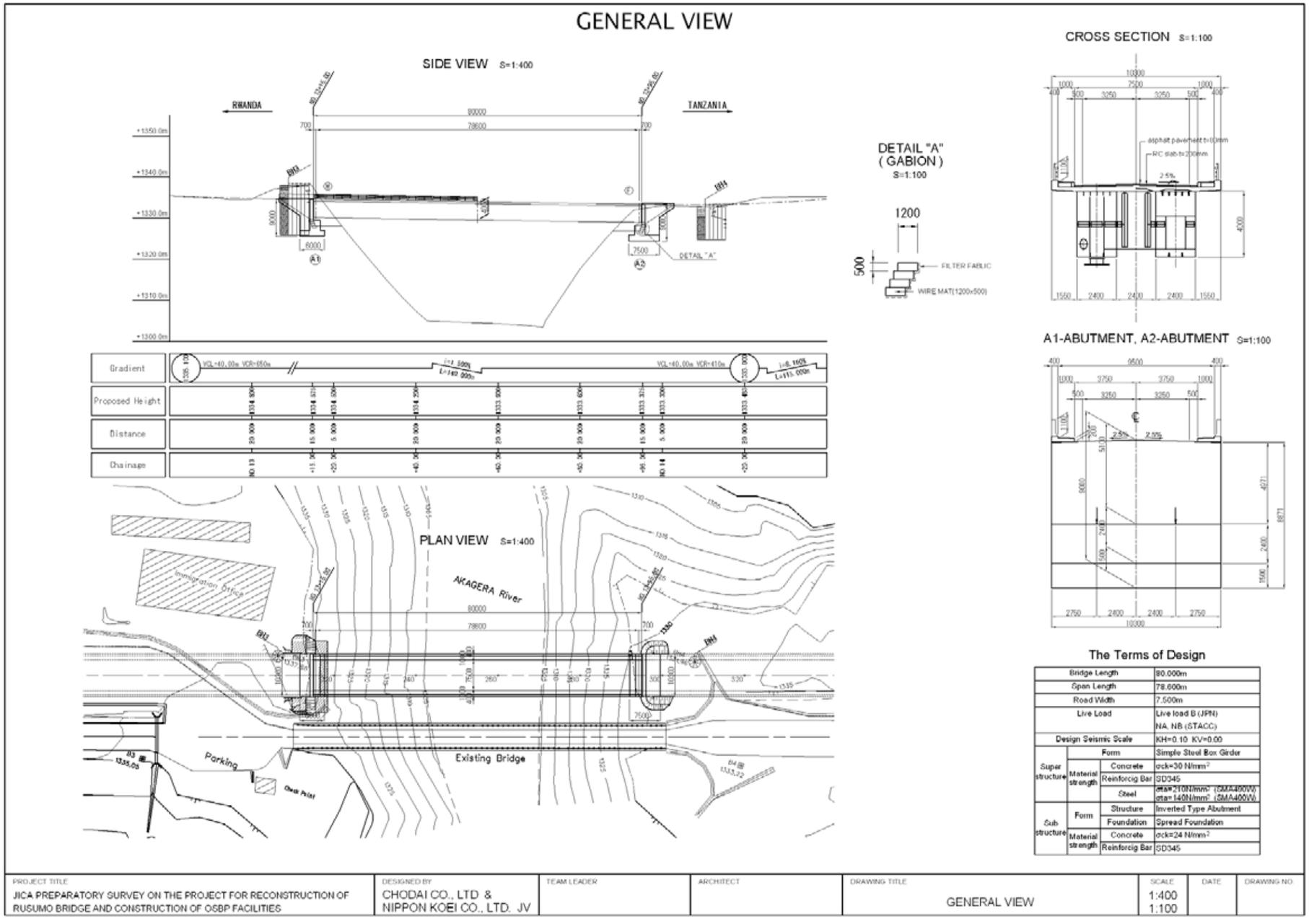
Border Facilities Of RWANDA

(NO.3+40)

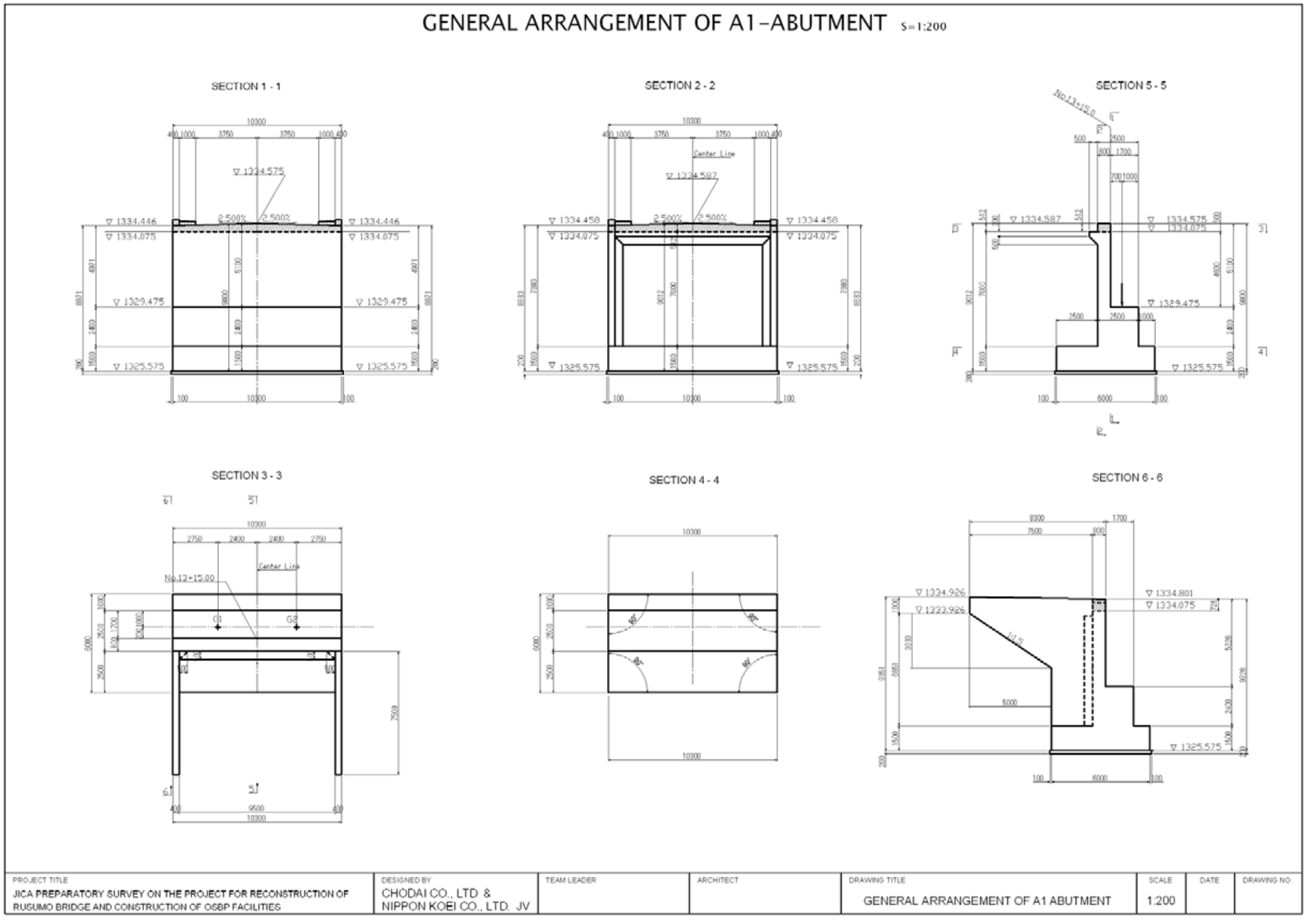
PROJECT TITLE	DESIGNED BY	TEAM LEADER	ARCHITECT	DRAWING TITLE	SCALE	DATE	DRAWING NO.
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV			TYPICAL CROSS SECTION (3)	1:200		9/65

2-2-3-2 Rusumo Bridge

General View



Structure Drawing of the Substructure



GENERAL ARRANGEMENT OF A2-ABUTMENT S=1:200

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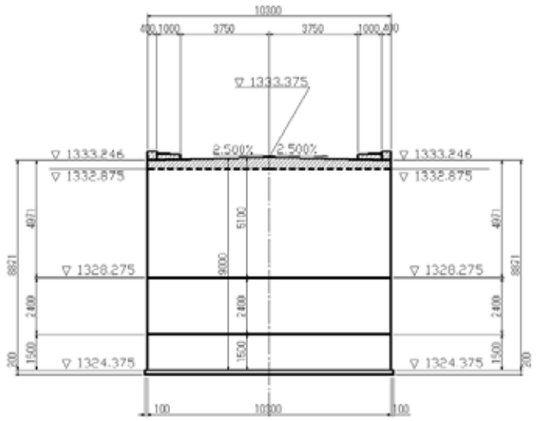
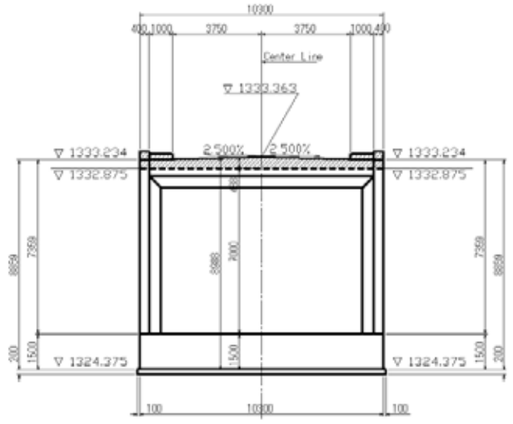
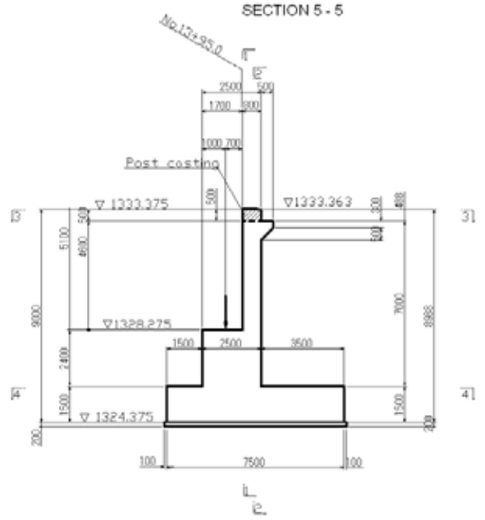


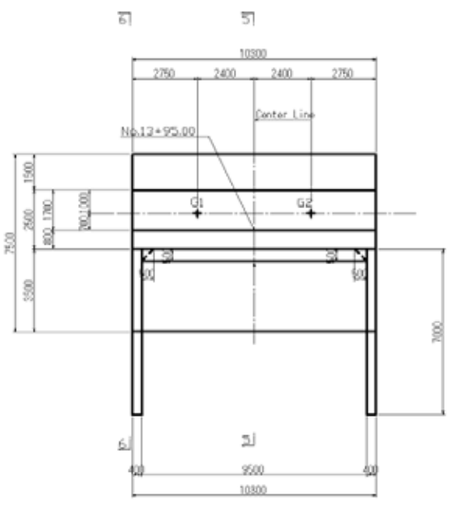
SECTION 2 - 2



SECTION 5 - 5



SECTION 3 - 3



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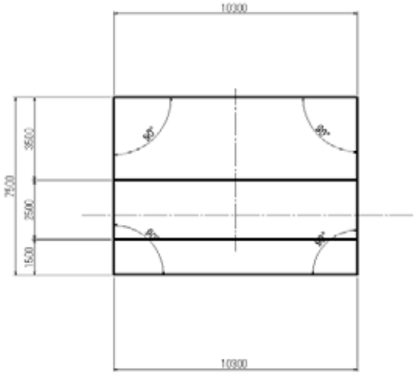
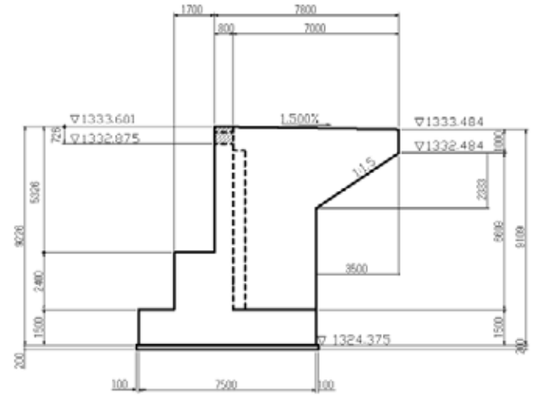


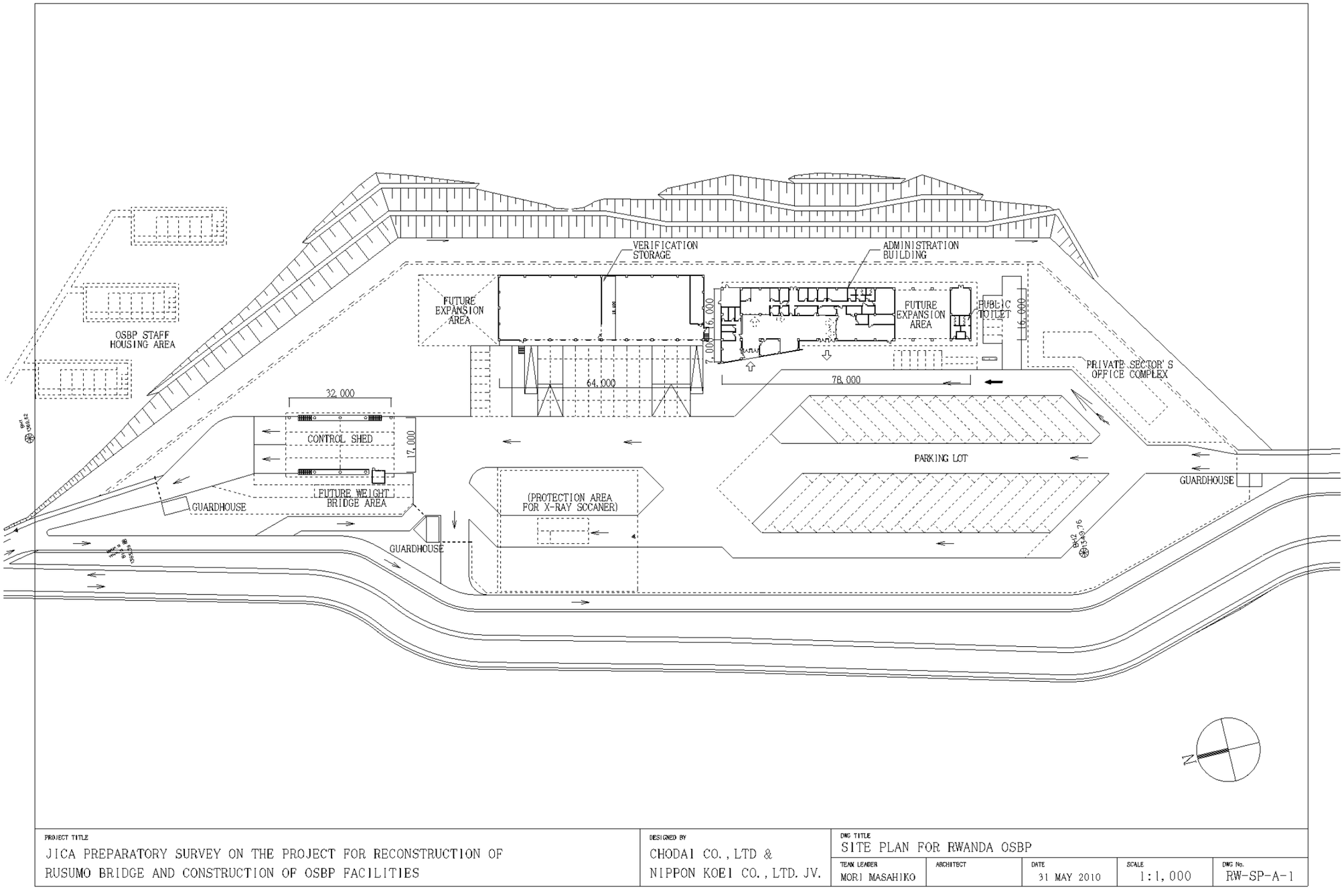
SECTION 6 - 6



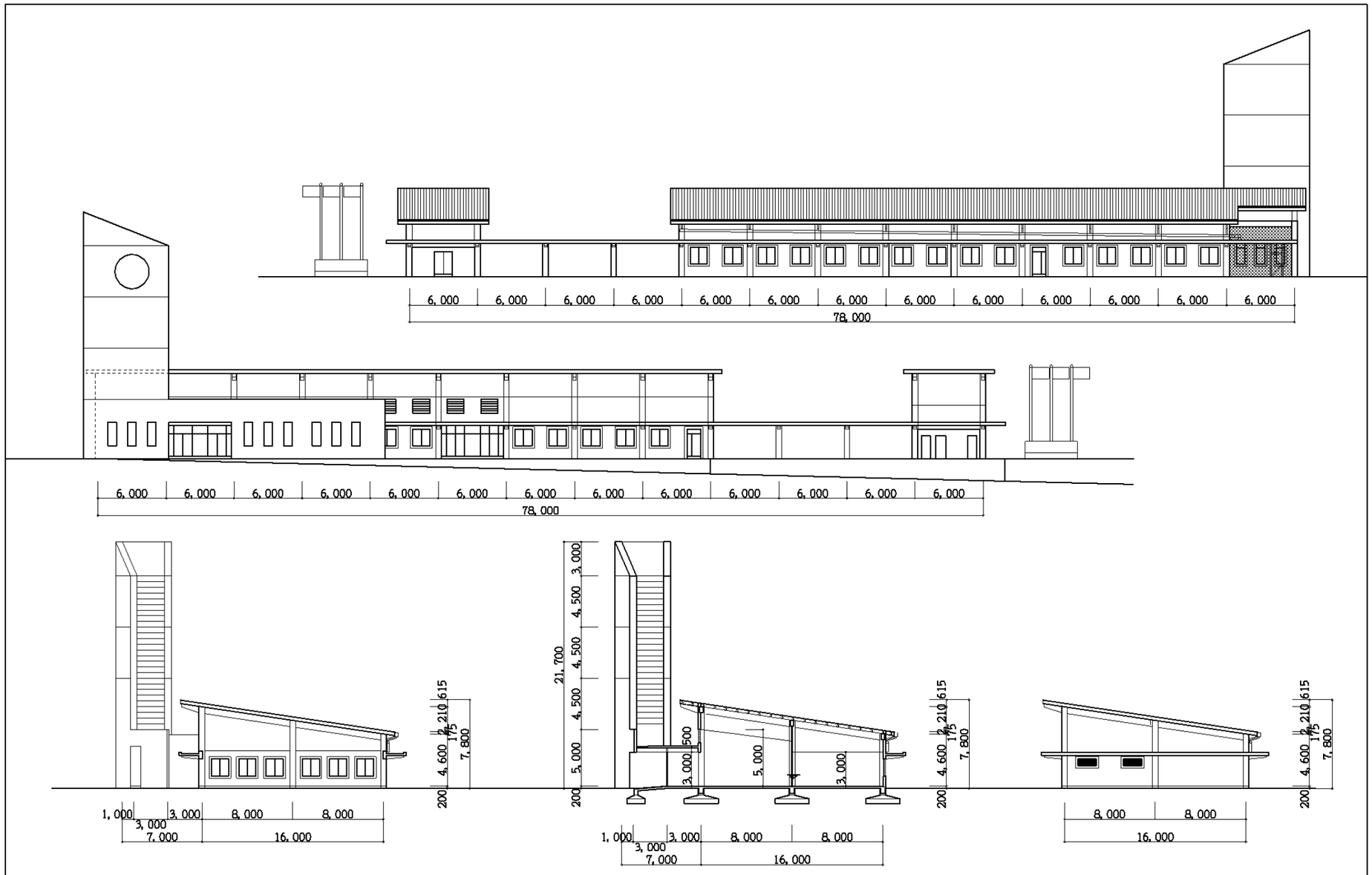
PROJECT TITLE	DESIGNED BY	TEAM LEADER	ARCHITECT	DRAWING TITLE	SCALE	DATE	DRAWING NO.
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV			GENERAL ARRANGEMENT OF A2 ABUTMENT	1:200		

2-2-3-3 OSBP Facilities

（1） Plan in Rwanda

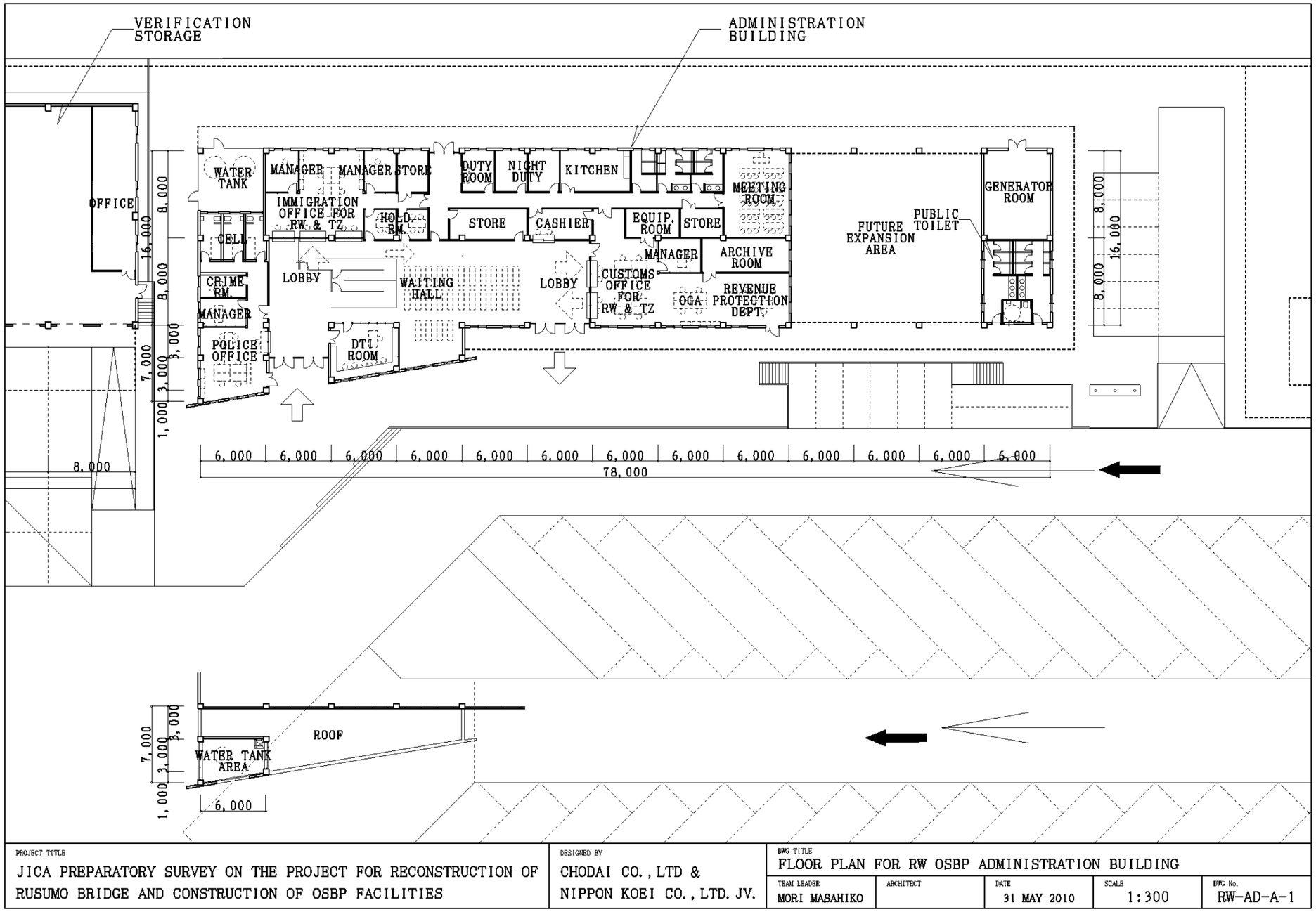


(2) Administration Building in Rwanda



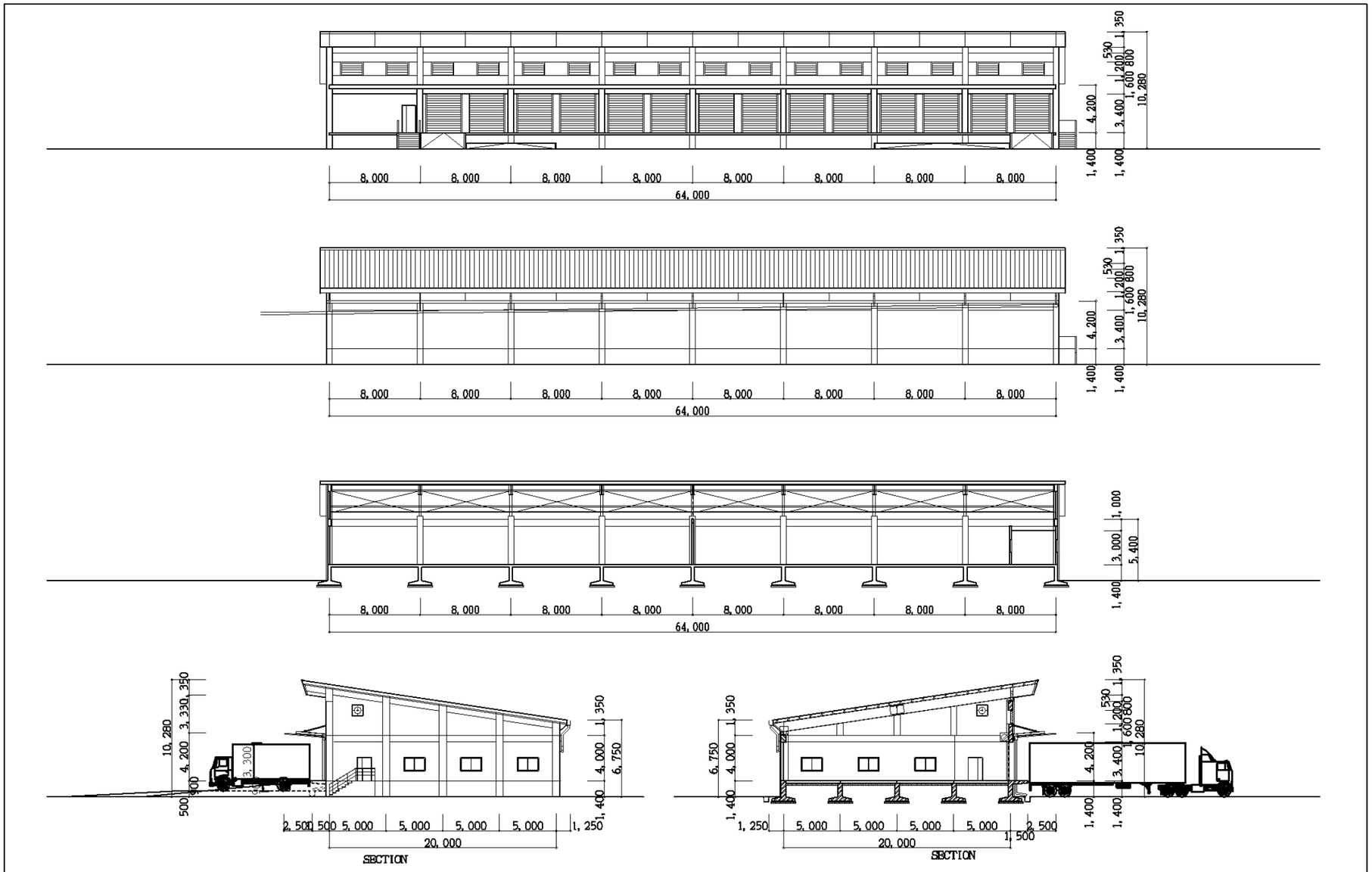
PROJECT TITLE JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	DESIGNED BY CHODAI CO.,LTD & NIPPON KOEI CO.,LTD. JV.	DWG TITLE ELEVATION-SECTION FOR RW OSBP ADMINISTRATION BUILDING			
		TEAM LEADER MORI MASAHIKO	ARCHITECT	DATE 31 MAY 2010	SCALE 1:300	DWG No. RW-AD-A-1

Plan



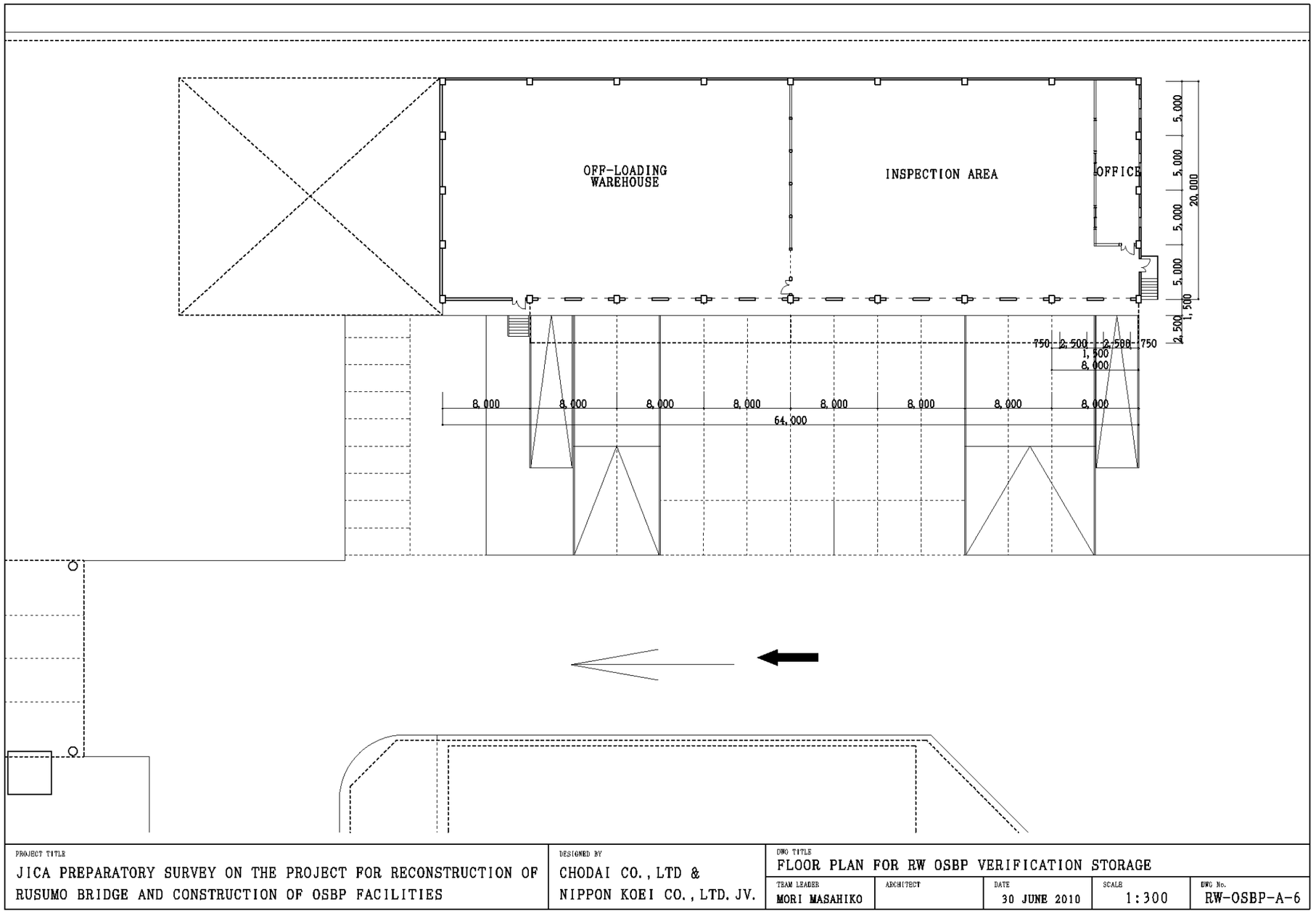
PROJECT TITLE	DESIGNED BY	DWG TITLE				
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.	FLOOR PLAN FOR RW OSBP ADMINISTRATION BUILDING				
		TEAM LEADER: MORI MASAHIKO	ARCHITECT:	DATE: 31 MAY 2010	SCALE: 1:300	DWG No.: RW-AD-A-1

(3) Verification Storage in Rwanda



PROJECT TITLE	DESIGNED BY	DWG TITLE				
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.	ELEVATION-SECTION FOR RW OSBP VERIFICATION STORAGE				
		TEAM LEADER: MORI MASAHIKO	ARCHITECT:	DATE: 31 MAY 2010	SCALE: 1:300	DWG No.: RW-VS-A-1

Plan


OFF-LOADING WAREHOUSE
INSPECTION AREA
OFFICE
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5,000
5,000
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1,500
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750
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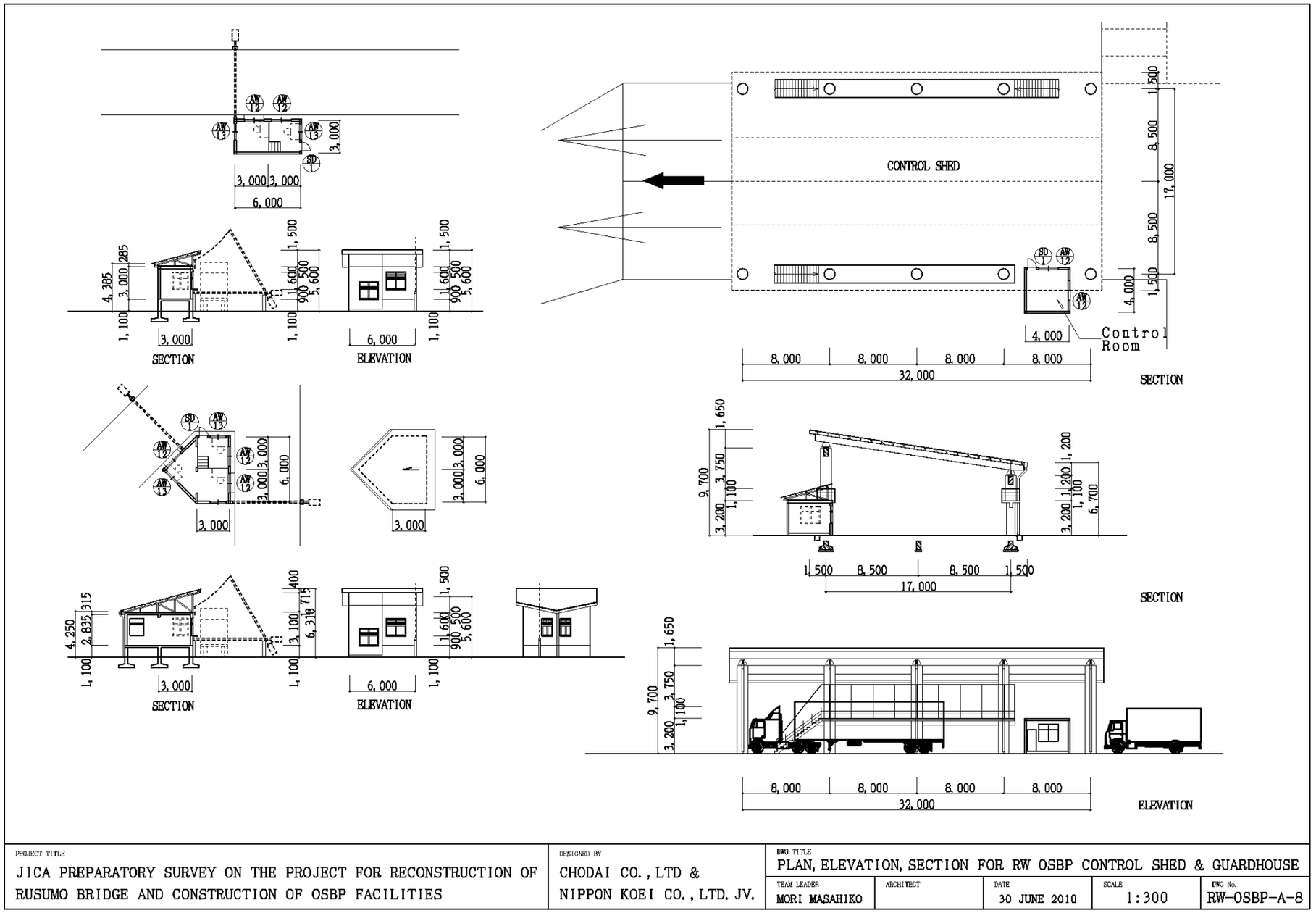
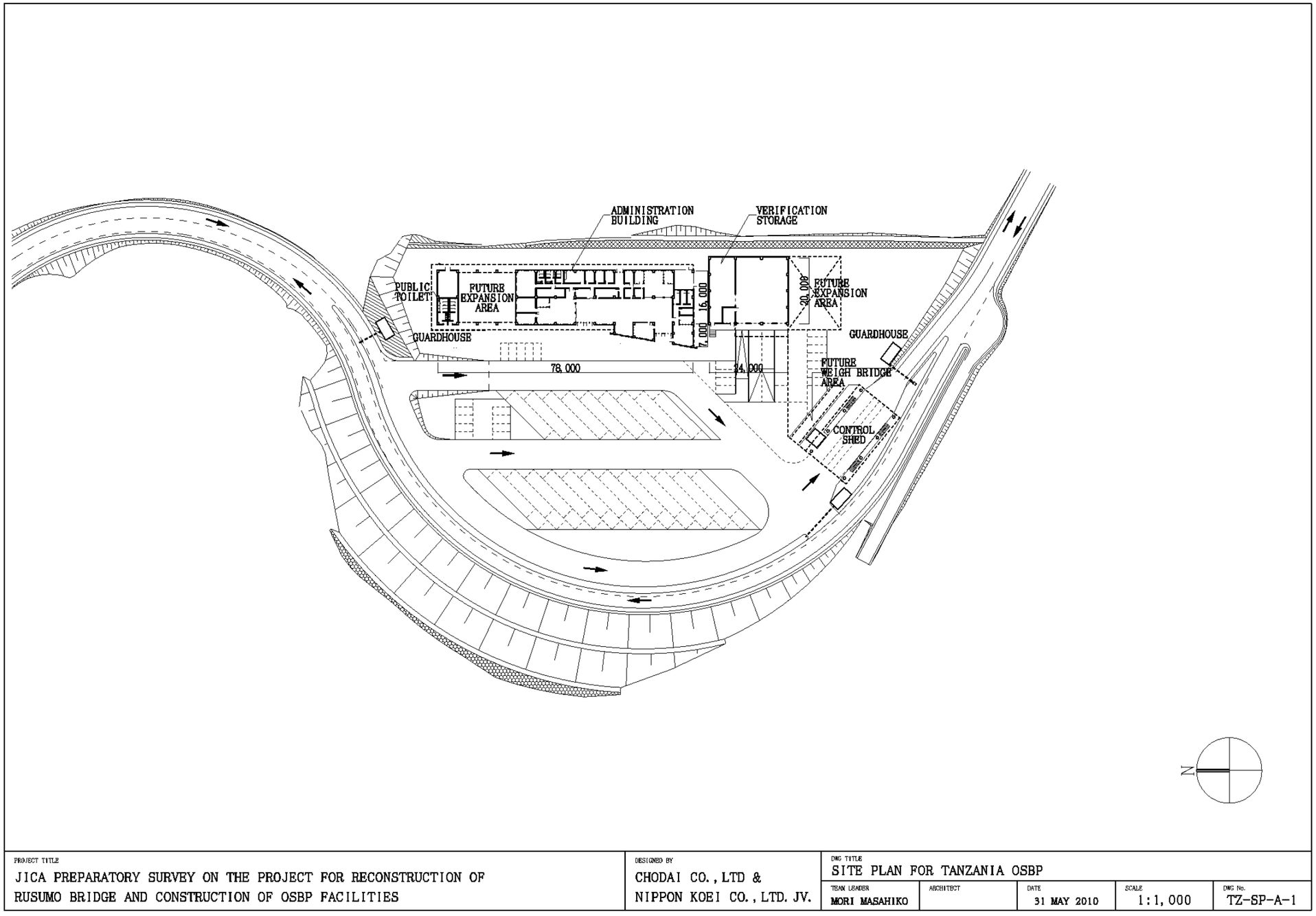
PROJECT TITLE
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES
DESIGNED BY
CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.
DWG TITLE
FLOOR PLAN FOR RW OSBP VERIFICATION STORAGE
TEAM LEADER
MORI MASAHIKO
ARCHITECT
DATE
30 JUNE 2010
SCALE
1:300
DWG No.
RW-OSBP-A-6

(4) Control Shed and Guardhouse in Rwanda

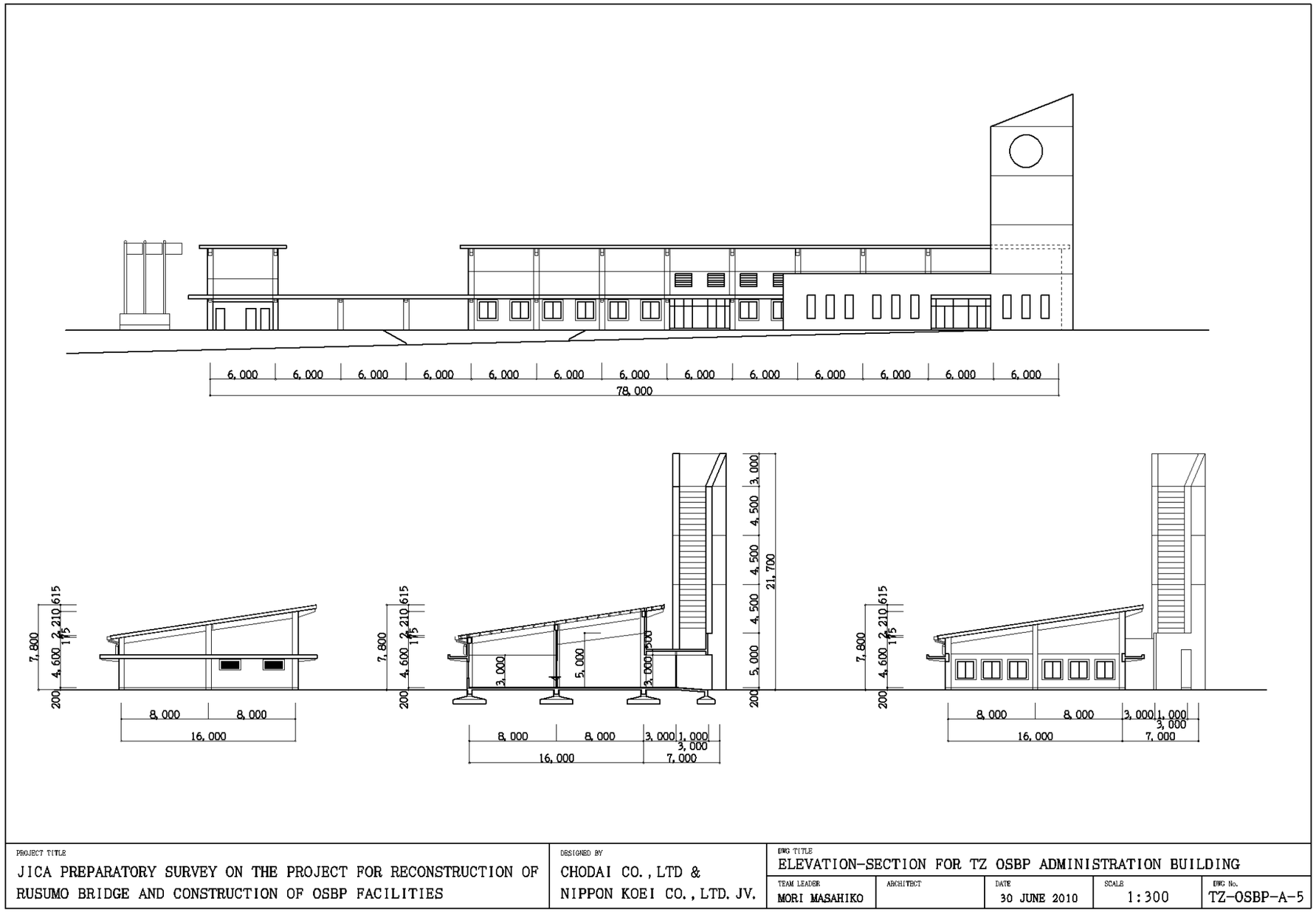


(5) Plan in Tanzania



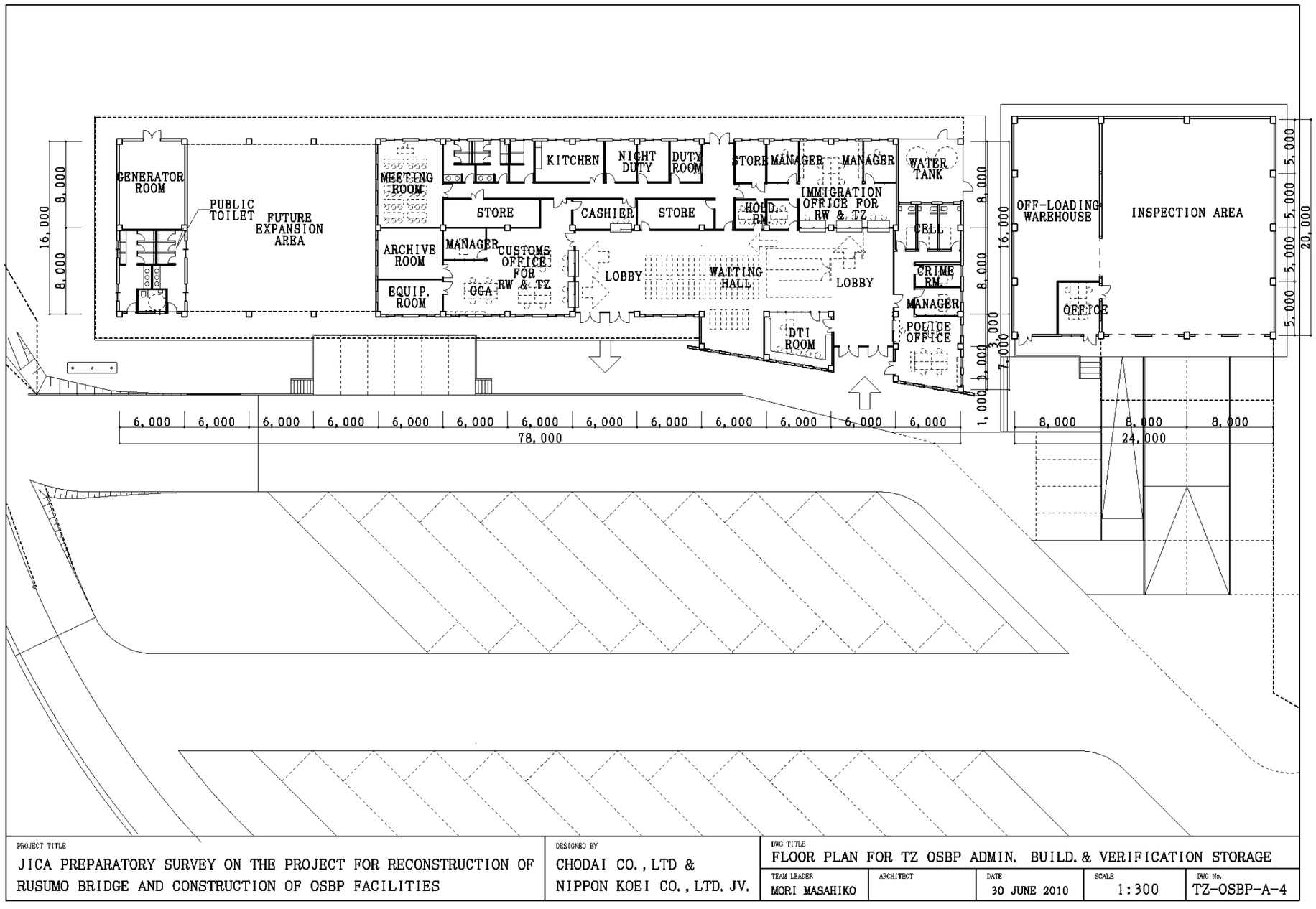
PROJECT TITLE JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	DESIGNED BY CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.	DWG TITLE SITE PLAN FOR TANZANIA OSBP				
		TEAM LEADER MORI MASAHIKO	ARCHITECT	DATE 31 MAY 2010	SCALE 1:1,000	DWG No. TZ-SP-A-1

(6) Administration Building in Tanzania



PROJECT TITLE JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	DESIGNED BY CHODAI CO.,LTD & NIPPON KOEI CO.,LTD. JV.	DWG TITLE ELEVATION-SECTION FOR TZ OSBP ADMINISTRATION BUILDING				
		TEAM LEADER MORI MASAHIKO	ARCHITECT	DATE 30 JUNE 2010	SCALE 1:300	DWG No. TZ-OSBP-A-5

Plan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PUBLIC TOILET
FUTURE EXPANSION AREA
MEETING ROOM
KITCHEN
NIGHT DUTY
DUTY ROOM
STORE
MANAGER
MANAGER
WATER TANK
STORE
CASHIER
STORE
HOLD RM.
IMMIGRATION OFFICE FOR RW & TZ
CELL
ARCHIVE ROOM
MANAGER
CUSTOMS OFFICE FOR RW & TZ
OGA
EQUIP. ROOM
LOBBY
WAITING HALL
LOBBY
CRIME RM.
MANAGER
POLICE OFFICE
DTI ROOM
OFF-LOADING WAREHOUSE
INSPECTION AREA
OFFICE
16,000
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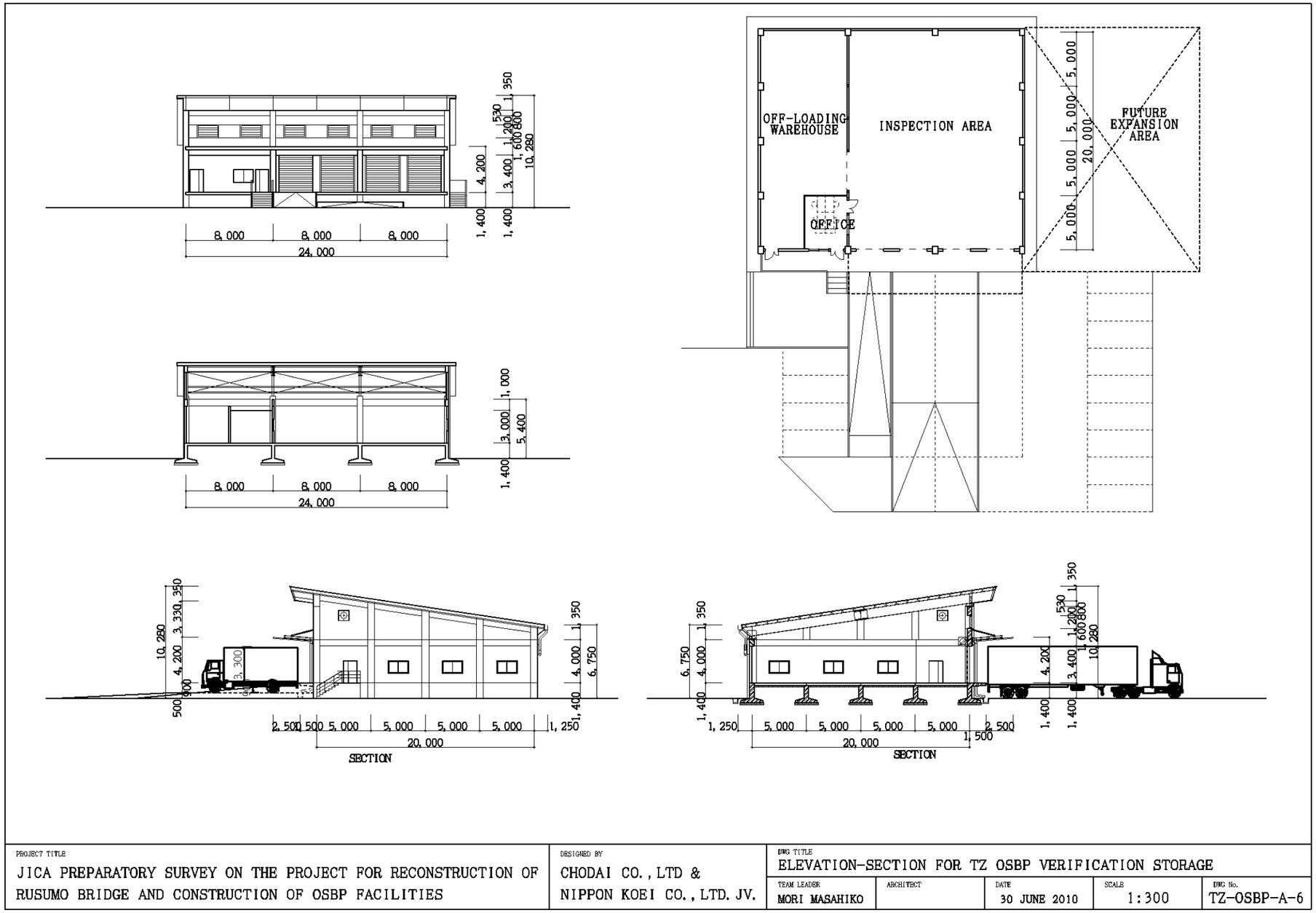
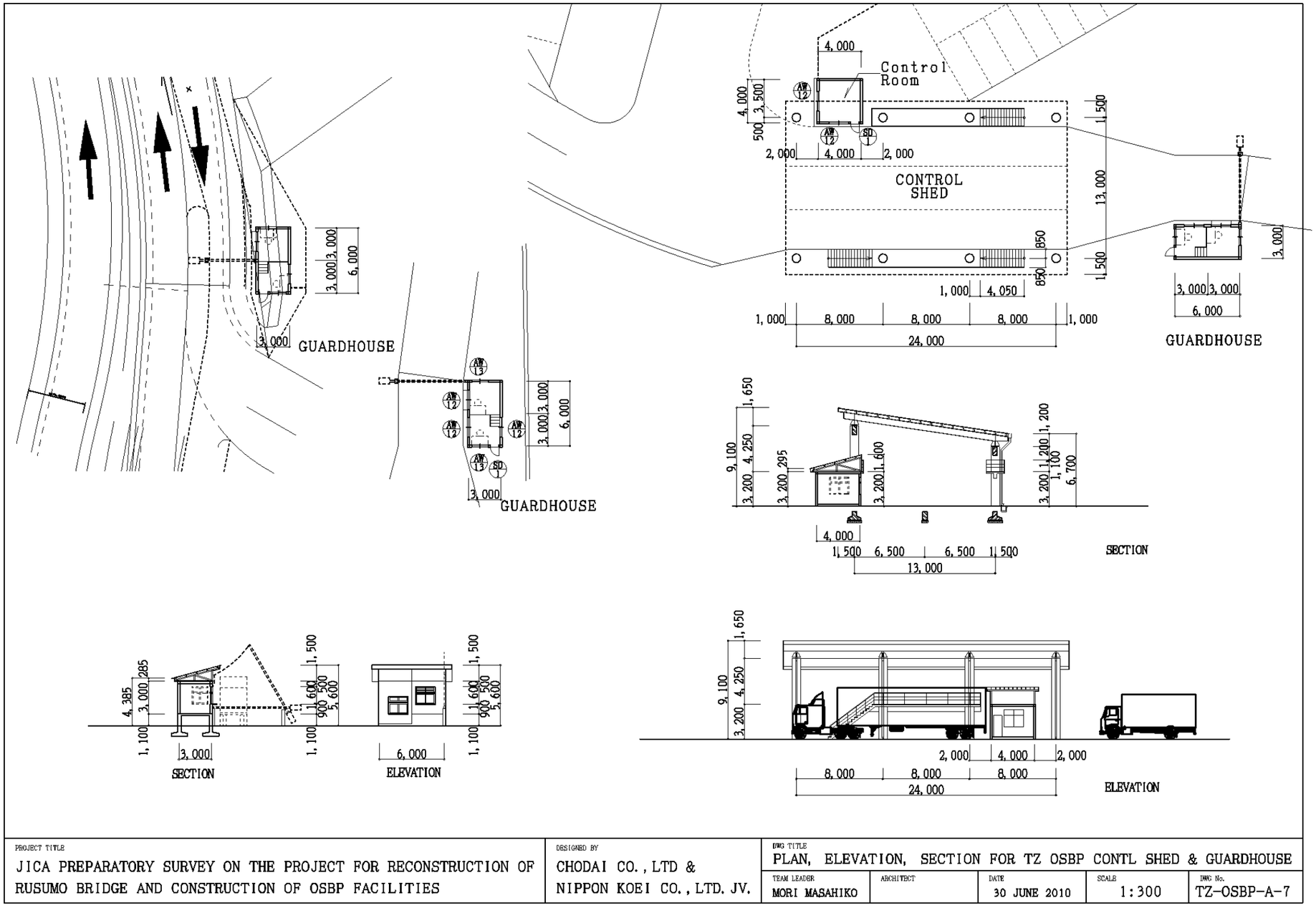
PROJECT TITLE
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES
DESIGNED BY
CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.
DWG TITLE
FLOOR PLAN FOR TZ OSBP ADMIN. BUILD. & VERIFICATION STORAGE
TEAM LEADER
MORI MASAHIKO
ARCHITECT
DATE
30 JUNE 2010
SCALE
1:300
DWG No.
TZ-OSBP-A-4

(7) Verification Storage in Tanzania



PROJECT TITLE	DESIGNED BY	DWG TITLE				
JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	CHODAI CO.,LTD & NIPPON KOEI CO.,LTD. JV.	ELEVATION-SECTION FOR TZ OSBP VERIFICATION STORAGE				
		TEAM LEADER	ARCHITECT	DATE	SCALE	DWG No.
		MORI MASAHIKO		30 JUNE 2010	1:300	TZ-OSBP-A-6

(8) Control Shed and Guardhouse in Tanzania



PROJECT TITLE JICA PREPARATORY SURVEY ON THE PROJECT FOR RECONSTRUCTION OF RUSUMO BRIDGE AND CONSTRUCTION OF OSBP FACILITIES	DESIGNED BY CHODAI CO., LTD & NIPPON KOEI CO., LTD. JV.	DWG TITLE PLAN, ELEVATION, SECTION FOR TZ OSBP CONTL SHED & GUARDHOUSE			
		TEAM LEADER MORI MASAHIKO	ARCHITECT	DATE 30 JUNE 2010	SCALE 1:300	DWG No. TZ-OSBP-A-7

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The actual components of the Project are civil engineering work for the roads, bridge and car parks for the OSBP facilities, building work for the OSBP facilities and procurement of equipment for the said facilities. Because of the small variety of equipment and their small quantities, the procurement (and installation, if necessary) of equipment is considered to form part of the construction work under the Project.

(1) Work Principles

- The existing border post facility sites are quite congested by many large trucks and the elimination of such traffic congestion prior to the commencement of the construction work is essential. For this reason, the construction of the new OSBP facilities in Rwanda some 750 m away from the present site towards Kigali will be conducted first. The construction of the new Rusumo Bridge and new OSBP facilities in Tanzania will commence once the border post facilities on the Rwandan side are relocated to the new facilities.

- The banking section for the new OSBP facilities in Tanzania will be conducted while allowing the current cross-border traffic. It is, therefore, planned to conduct this work along side the construction of the new OSBP facilities in Rwanda.

- Throughout the construction period, the traffic restrictions for the existing Rusumo Bridge, i.e. maximum axle load of 8 tons and travelling speed of 5 km/hr, will be maintained.

- Where necessary, any existing buildings housing border post facilities in Rwanda and Tanzania will be relocated to a temporary building(s).
- Because of the need to secure additional land and to relocate some houses, the governments of both countries will be urged to complete the compensation procedure by the time that the actual work under the Project commences.

- Traffic controllers will be deployed in view of the mixed traffic of border crossing vehicles and work vehicles.

- Because of the work in an international border zone, border crossing permits or similar will be issued so that those involved in the work can smoothly cross the border.

(2) Procurement Principles

- Materials and equipment will be locally procured as much as possible.

- The procurement plan will be designed to allow the maximum use of local workers, etc. to contribute to the creation of employment opportunities and vitalisation of the local economy.

- Power supply by the Rwanda Electricity Corporation to the project sites is unlikely to be available in time for the Project and, therefore, a power generator will be used for power supply for the work and power equipment operation.

2-2-4-2 Implementation Conditions

(1) Important Points for the Construction Work

- The establishment of construction yards near the new OSBP facility site in Rwanda and near the new Rusumo Bridge in Tanzania is planned.

- Analysis of past daily rainfall data for the area reveals that the daily rainfall level is not very high throughout the year. It is, therefore, planned to continue the work without any interruption in the rainy season.

- Based on the hydrological survey results for Akagera River, it is believed that neither the new Rusumo Bridge nor the new OSBP facilities will be affected by water level fluctuations of Akagera River.

- Because the work involves an international trunk road, a detour will always be available to secure constant cross-border traffic flow.

- Functioning border post facilities will be constantly maintained throughout the project period.

- Work safety will be the paramount condition for the construction of the new Rusumo Bridge.

(2) Important Points for Procurement

- Preferred status will always be given to locally procurable labour.

- Locally produced products will be procured as much as possible.

- Procurement priority will be given to those imported goods which are permanently available in the market of Rwanda or Tanzania.

- Materials of which the local procurement is difficult will be procured in Japan or a third country. The actual supply source will be determined in consideration of the price, quality, delivery terms and other relevant conditions.

- In regard to the leasing of equipment, priority will be given to the construction machinery possessed by local construction companies.

- Equipment of which local procurement is difficult will be procured from Japan or a third country. The actual supply source will be determined in consideration of the transportation cost, rental charge and other relevant conditions.

2-2-4-3 Scope of Works

The division of work for the Project between Japan and Rwanda/Tanzania is shown in Table 2-27.

Table 2-27 Division of Work

Undertakings by Japan	Undertakings by Rwanda/Tanzania
• Construction of roads, new Rusumo bridge and OSBP facilities listed in the Basic Plan • Construction and removal of the temporary border post facilities in Rwanda and Tanzania • Construction and removal of the temporary site offices and project management office • Planning and implementation of safety measures during the construction period • Procurement and transportation of construction equipment in accordance with the equipment procurement plan and its re-export to the country of origin Preparation of the detailed design and tender documents, assistance for the tender and work supervision as specified in the work supervision plan	• Securing of the necessary land for the implementation of the Project • Compensation for residents for resettlement because of the Project • Future use of the existing Rusumo Bridge • Banking arrangements (B/A), arrangement of and authority to pay (A/P) and payment of banking costs • Tax exemption for equipment, etc. to be imported to Rwanda or Tanzania by Japanese companies working for the Project and assistance for its customs clearance • Exemption of services and goods provided by Japanese companies working for the Project from customs duty, domestic taxes and other financial levies • Management and maintenance of the facilities constructed under the Project • Payment of the full EIA cost • Obtaining of construction authorisation • Issue of cross-border permits which will be valid throughout the construction period • Relocation of the existing border post facilities • Purchase of general office equipment and furniture for the new OSBP facilities • Water supply to the water tank and purchase of drinking water • Installation of a power supply system for the new OSBP facilities (Tanzania); construction of a high voltage transmission line to the new OSBP facilities (Rwanda) • Construction of new staff accommodation (Rwanda) • Relocation of the building to house the X-ray scanner and also the X-ray scanner itself (Rwanda) • Construction of facilities to serve the private sector (Rwanda) • Payment of registration fees to the CRB and ERB (Tanzania)

2-2-4-4 Consultant Supervision

Work supervision will be conducted to ensure quality control, schedule control and safety control. Quality control aims at ensuring the quality of the construction materials and work precision of structures and will rely on material test certificates to be provided by manufacturers and field material testing. In regard to schedule control, the work progress will be regularly checked based on the schedule plan so that the Project is completed within the required period under Japan's grant aid scheme. For this purpose, critical types of work must be identified. For safety control, construction companies will be required to provide safety education for their workers. The implementation of suitable safety measures and arrangements by these companies will be checked to prevent work-related accidents.

2-2-4-5 Quality Control Plan

Quality control of the construction materials and products will be conducted using quality-related indices and specifications detailing the required accuracy of production and installation. The subject control items and inspection frequencies are shown in Table 2-28.

Table 2-28 Quality Control Plan

Type of Control	Item	Control Contents	Frequency
Material Inspection	Aggregates	Grading; specific gravity; hardness; stability	By area of production; every 250 m^3
	Cement	Grading; specific gravity; strength	By manufacture; every 30 tons
	Steel girders	Strength	By lot
	Reinforcing bars	Strength; bending workability	By lot
	Asphalt	Viscosity; penetration; softening point	By lot
	Banking soil	Grading; specific gravity; moisture content; plasticity/liquid limit; compactability; CBR	By area of production; every 500 m^3
Product Inspection	Fresh concrete	Temperature; slump	Every 5 m^3 at the work site
	Hardened concrete	Strength; unit weight	Every 30 m^3
	Asphalt mixture	Amount of asphalt	Every 30 tons at the work site
	Banked bed	Field density	Every 25 m^2
	Steel girders	Dimensions; linearity	100% inspection
	Foundations and substructure	Dimensions; position; height	100% inspection
	Superstructure	Dimensions; position; height	Every 5 m along the direction of the road
	Asphalt paving	Thickness; flatness; height	Every 100 m^2 for thickness; every 5 m for flatness and height along the direction of the road

2-2-4-6 Procurement Plan

Most of the key materials to be used for the construction work under the Project will be locally procured. These include crushed stones, aggregates, cement, timber, plywood, bricks and square logs. Reinforcing bars, asphalt and some building materials (roofing materials, flooring materials, window glass and others) are also available in the local market although they are imported products. In contrast, it will be necessary to procure atmospheric corrosion-resistant steel and some other products for the bridge in Japan or a third country. Table 2-29 shows the planned supply sources for the main materials and construction machinery.

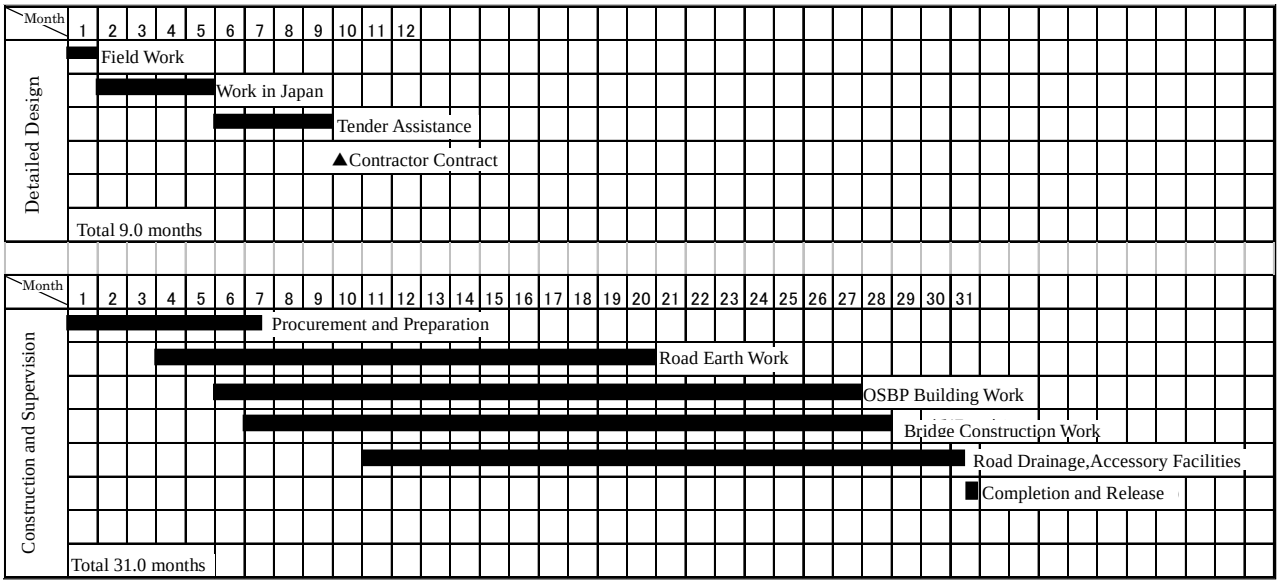
Table 2-29 Supply Sources for the Main Materials and Construction Machinery

Category	Item	Supply Source	Note
Materials	Sand; crushed stones; aggregates	Rwanda; Tanzania	
	Cement	Rwanda; Tanzania	
	Reinforcing bars	Rwanda, Tanzania	
	Timber; plywood	Rwanda; Tanzania	
	Steel for the bridge	Japan	Atmospheric corrosion-resistant steel
	Various products for the bridge (bearings; expansion joints and others)	Japan	
	Building materials (bricks; roofing materials; flooring materials; window glass; others)	Rwanda; Tanzania	Local procurement of imported products except locally manufactured bricks
	Asphalt mixture	Rwanda; Tanzania	Local procurement of imported products
	Drainage pipes	Rwanda; Tanzania	As above
Heavy Construction Machinery and Vehicles	Bulldozer	Rwanda; Tanzania	
	Backhoe	Rwanda; Tanzania	
	Dump truck	Rwanda; Tanzania	
	Truck crane	Japan	Hydraulic 5 tons and 16 tons
	Rafter crane	Japan	Hydraulic 20 tons and 25 tons
	Crawler crane	Japan	Hydro-mechanical 30 tons and 50 tons
	Road roller	Rwanda; Tanzania	
	Concrete plant	Japan	
	Truck mixer	Japan	
	Asphalt plant	Rwanda; Tanzania	

2-2-4-7 Implementation Schedule

Following the completion of the detailed design and tender stages, the selected contractor will conclude construction agreements with the Governments of Rwanda and Tanzania. The actual construction work should swiftly commence after the signing of these agreements, beginning with the construction of the bypass road and OSBP facilities on the Rwandan side. Table 2-30 shows the implementation schedule of the Project.

Table 2-30 Implementation Schedule



2-3 Obligations of Recipient Countries

2-3-1 General Issues Regarding Japan's Grant Aid Scheme

- Securing of the necessary land for the implementation of the Project
- Compensation for residents for resettlement because of the Project
- Banking arrangements (B/A), arrangement of and authority to pay (A/P) and payment of banking costs
- Tax exemption for equipment, etc. to be imported to Rwanda or Tanzania by Japanese companies working for the Project and assistance for its customs clearance
- Exemption of services and goods provided by Japanese companies working for the Project from customs duty, domestic taxes and other financial levies
- Management and maintenance of the facilities constructed under the Project

2-3-2 Specific Issues to the Project

(1) Obligations Applicable to Both Countries

- Payment of the full EIA cost
- Obtaining of construction authorisation
- Issue of cross-border permits which will be valid throughout the construction period (personal IDs and vehicle permits)
- Relocation of the existing office equipment for the border post facilities (relocation of the said facilities)
- Purchase of general office equipment and furniture for the new OSBP facilities
- Water supply to the water tank and purchase of drinking water

(2) Specific Obligations of the Government of Rwanda

- Construction of a power supply system for the new OSBP facilities (installation of a high voltage transmission line to the OSBP facilities on the Tanzanian side)
- Construction of new staff accommodation and relocation of the building to house the X-ray scanner and also the X-ray scanner itself

- Construction of facilities to serve the private sector

(3) Specific Obligations of the Government of Tanzania

- Payment of registration fees to the CRB (Contractor Registration Board) and ERB (Engineer Registration Board)

2-4 Project Operation Plan

2-4-1 Present State of the Maintenance System

In Rwanda, the Rwanda Transport Development Agency (RTDA) is responsible for the maintenance of national roads and bridges. The RTDA recently split from the MININFRA to become responsible for the construction and maintenance of national roads and bridges. While the MININFRA will own the new OSBP facilities in Rwanda, the Rwanda Revenue Authority (RRA) and other bodies actually using these facilities will be responsible for the maintenance of the facilities used by them.

In Tanzania, the Tanzania National Roads Agency (TANROADS) is responsible for the maintenance of national roads and bridges. The TANROADS is an established body with a long history and has developed its own standards with its many well-experienced engineers. The Tanzania Building Agency (TBA) will be responsible for the construction and maintenance of the new OSBP facilities in Tanzania but these facilities will be operated by their users, including the Tanzania Revenue Authority (TRA).

2-4-2 Maintenance Budget

Table 2-31 shows the scale of the current maintenance budget of the various bodies to be responsible for the maintenance of the road and facilities to be constructed under the Project.

Table 2-31 Maintenance Budget of the Two Countries

	FY 2007/2008	FY 2008/2009	FY 2009/2010
Current Expenditure of the MININFRA (Road Sector) Unit: billion RWF (US$ million)	34.68 (59.79)	47.90 (82.59)	61.52 (106.07)
Current Expenditure of the MININFRA (Maintenance) Unit: billion RWF (US$ million)	-	-	50.30 (86.72)
Current Expenditure of the TANROADS (Maintenance) Unit: billion TZS (US$ million)	136,469 (101.24)	147.205 (109.20)	177.462 (131.65)
Current Expenditure of the TBA (Maintenance) Unit: billion TZS (US$ million)	0.733 (0.54)	0.742 (0.55)	0.890 (0.66)

1 US$＝580 Rwanda Fran＝1,348 Tanzania Shilling

The scale of the maintenance budget of these organizations in both countries has been steadily increasing, suggesting the prevailing stance of ensuring continual maintenance due to a full understanding of the importance of maintenance.

2-4-3 Project-Related Maintenance Plan

Table 2-32 shows the recommended necessary maintenance items and frequency of work to ensure the healthy state of the structures to be constructed under the Project.

Table 2-32 Recommended Maintenance of the New Facilities

Category	Section	Description of Required Work	Approximate Frequency
Road	General	Cleaning (road surface, shoulders, slopes and side ditches)	Monthly
	Paving	Visual checking and repair if cracks and potholes are found	Annually
		Scraping and overlay (asphalt paving)	Every 10 years
		Re-paving (asphalt paving)	Every 30 years
	Shoulders (paved/unpaved)	Visual checking and repair if necessary	Annually
	Slopes	Visual checking and repair of any eroded slopes	Annually
	Side ditches	Removal of deposited sediment	Annually
Bridge	Steel girders	Visual checking; photographing and annual recording of any deformation or damage	Annually
	Bearings, deck and incidentals	Cleaning (road surface, expansion joints, bearings, catch basins and drainage pipes)	Monthly
	Paving	Scraping and overlay	Every 20 years
		Replacement (including waterproofing work)	Every 40 years
	Bearings	Checking of any lateral shift, corrosion and rubber deterioration; photographing and annual recording of any change	Annually
	Handrails and guard fence	Checking of any damage and its extent; photographing and annual recording of damage	Annually
	Expansion joints	Visual checking; photographing and annual recording of any deterioration and/or damage	Annually
	Drainage	Visual checking; photographing and annual recording of any deterioration and/or damage	Annually

OSBP Facilities

Category	Water tank; elevated water tank	Checking of the water quality and presence of foreign matters; cleaning of the inside of the tanks	Annually
Border Facility	Toilets	Cleaning of sanitary ware and floors	Daily
	Septic tank	Removal of sludge	Six monthly
	Air-conditioning units	• Checking of units Cleaning (and replacement) of filters and cleaning of drainpipes and drain pans	Annually Six monthly
	Emergency generator	Test operation	Monthly
	Incoming panel; distribution board	• Cleaning Checking of connectors, terminals and display	Monthly Annually
	Fire extinguishers	Visual checking and confirmation of the number in place	Six monthly
	Fire alarm system	Checking of the system	Six monthly
Category Road	Lifting pump	Maintenance and checking	Annually
	Ventilation fan	Maintenance and checking	Annually
	Lighting devices	Cleaning and replacement of the lamps if necessary	Annually
	Drainage ditches at car park	Cleaning of the ditches, drainage pipes and catch basins	Monthly
	Section	Description of Required Work	Approximate Frequency
	General	Cleaning (road surface, shoulders, slopes and side ditches)	Monthly

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Estimation of the Project Cost for Each Recipient Country

Rwanda

1)	Full EIA cost	:	US$ 75,000
2)	Land acquisition / Compensation cost	:	US$ 100,000
3)	Banking fees (for B/A and A/P)		US$ 215,000

Tanzania

1)	Full EIA cost	:	US$ 75,000
2)	Land acquisition / Compensation cost	:	US$ 600,000
3)	Banking fees (for B/A and A/P)	:	US$ 215,000
4)	CRB and ERB registration cost	:	US$ 63,000

2-5-2 Operation and Maintenance Cost

The main maintenance items relating to the road, bridge and OSBP facilities to be constructed under the Project will be the regular checking and repair of the road and bridge, repaving of the bridge deck, slope repair at banked or cut sections and the replacement of lighting lamps. The resulting (average annual) maintenance cost is estimated to be US$ 16,440

Table2-33 Expected Maintenance Work

Unit : US$

Item	Frequency	Subjects for Checking	Description of the Work	Estimated Cost (Annual)
Maintenance of the civil engineering sections of the road	Annually	Shoulders (paved or unpaved); slopes	Weeding; reshaping of the slopes	650
Maintenance of the road paving	Asphalt parts: annually Concrete parts: every 5 years	Paving	Overlay; replacement Partial replacement (0.1% of the total area)	1,060 1,700
Checking and cleaning of the bridge	Annually	Road surface; handrails; expansion joints; bearings; drainage system	Checking and cleaning	220
Repair of various sections of the bridge	Every 30 years	Bridge structure; bearings; bridge deck; incidental facilities	Cross-sectional repair; replacement; overlay	6,900
Checking and cleaning of the water tank, elevated water tank and water pipes at the OSBP facilities	Annually	Water tank; elevated water tank; water pipes	Checking and cleaning	330
Cleaning of the toilets at the OSBP facilities	Daily	Toilets	Cleaning	2,000
Removal of sludge from the septic tanks at the OSBP facilities	Six monthly	Septic tanks	Removal of sludge	1,300
Checking and cleaning of various systems at the OSBP facilities	Annually	Air-conditioning system; incoming panel and distribution panels; fire alarm system; lifting-up pump; ventilation fans; fire extinguishers	Checking and cleaning	200
Lighting apparatus	Annually	Lighting apparatus	Replacement of lamps	1,950
Drainage ditches at the car park	Monthly	Drainage ditches; drainpipes; catch basins	Cleaning	130
Total				16,440

2-6 Other Relevant Issues

One of the preconditions for the implementation of the Project is the establishment of an institutional framework for the operation of the new OSBP facilities, i.e. legal arrangements to enable the operation of the OSBP facilities. With the signing of the relevant bilateral agreement between Rwanda and Tanzania in March, 2010, this condition has now been met.

Chapter 3. Evaluation of the Project

3-1 Preconditions for the Project

3-1-1 Preconditions for Project Implementation

There are several likely preconditions for project implementation as described below.

(1) Resettlement of Residents and Acquisition of Land

There are some private houses, staff accommodation and shops on the planned routes for the planned roads and site for the new OSBP facilities. On the Rwandan side, one private house on the planned new OSBP facility site will require relocation while some five private houses (including stores) and staff accommodation located in the planned extension area to accommodate the new OSBP facilities will require relocation on the Tanzanian side. At the 4th meeting of the JTC, it was confirmed that the agreements on resettlement and compensation would be completed by the end of September, 2011 and that the necessary land would be acquired by the end of December, 2011. Both countries are now required to conduct the necessary resettlement and land acquisition as scheduled.

(2) Obtaining of Construction Authorisation

In Rwanda, it is necessary to obtain construction authorisation for both the bridge and the OSBP facilities. The necessary application will be made by the Ministry of Infrastructure to the relevant local government and this authorisation is usually granted in approximately one and a half months. While such authorisation is unnecessary for the bridge in Tanzania, authorisation by the department in charge of building construction must be obtained for the OSBP facilities. Both countries must, therefore, obtain the above authorisation in time for the commencement of the construction work.

(3) Approval of the Full EIA Report

An approved EIA for the Project is required in both countries based on the environmental law of each country. For this purpose, environmental engineers from both countries organized a meeting to obtain approval of the EIA and discussed the formulation of a TOR for the joint recruitment of an environmental consultant. The relevant decisions taken at the 4th JTC meeting included engagement in the EIA approval procedure by the end of October, 2010 and the completion of this procedure by the end of July, 2011. Both countries must, therefore, obtain approval of the full EIA report as scheduled.

(4) Continued Maintenance of the Existing Rusumo Bridge

The existing Rusumo Bridge will continue to be used by general traffic as well as project-related vehicles during the construction of the new bridge and OSBP facilities and thereafter. This makes it essential for both countries to continue their bridge maintenance work. The existing axle load and travelling speed restrictions will remain unchanged.

(5) Issue of Border Crossing Permits During the Construction Period

When the construction of the new Rusumo Bridge and OSBP facilities starts, it will be necessary for construction workers and other staff of the contractor and subcontractors to frequently cross the border. As the work cannot efficiently proceed if it is necessary for everyone involved in the Project to undergo the border crossing procedure each time they need to cross the border, it will be necessary for both countries to issue a border crossing permit (pass) to each person concerned which is valid for the duration of his/her involvement in the Project.

(6) Move from the Existing Border Facilities

Rwanda and Tanzania will be responsible for the removal of furniture, etc. from the existing border facilities to the new OSBP facilities and the procurement and moving in of the new office furniture and equipment after the completion of the new OSBP facilities.

3-1-2 Preconditions and Important Assumptions

The tasks to be effectively performed by both Rwanda and Tanzania are described below as preconditions to ensure the achievement and sustainment of the project outputs. Important assumptions to achieve the project outputs and their subsequent sustainment are described in 3-1-2-2.

3-1-2-1 Tasks to be Performed by Rwanda and Tanzania

(1) Proper Operation and Maintenance of the Newly Constructed Facilities

Appropriate maintenance will be required for the newly constructed bridge, roads and OSBP facilities and the newly procured equipment to properly function for a long period of time. To ensure such maintenance, it will be necessary for both Rwanda and Tanzania to allocate sufficient budget to carry out periodic inspection and necessary repairs.

(2) Supply of Electricity and Water to the New OSBP Facilities

It will be necessary for both Rwanda and Tanzania to supply electricity and drinking water to the new OSBP facilities. Rwanda plans to extend the power supply line to its OSBP facilities by 2012 and further extension of this line to the Tanzanian facilities is also planned. In the case of drinking water, both countries are expected to supply drinking water to the water tank in the new OSBP compound.

(3) Improvement of Staff Accommodation and Necessary Private Sector Facilities

Relocation of the existing staff accommodation is necessary because of the Project and this relocation work will be undertaken by Rwanda and Tanzania. The two countries are also expected to arrange the necessary banking and other private sector facilities at the new OSBP facilities.

3-1-2-2 Important Assumptions for the Project

(1) Improvement of the Central Corridor

The Rusumo border point is situated on the Central Corridor and the elimination of the current axle load and travelling speed restrictions with the opening of the new bridge is expected to increase the traffic volume between Kigali in Rwanda and Dar es Salaam in Tanzania. However, rehabilitation work is currently in progress in the Manyoni-Singida section of this corridor in Tanzania while no donors have yet been finalised to assist the necessary rehabilitation of the Lusahunga-Rusumo section. It is essential for Tanzania to secure the necessary funding to improve the road conditions along the entire Central Corridor.

(2) Staff Training to Ensure Smooth Transition to New OSBP Facilities

As the Project intends the renewal of the existing bridge, roads and border facilities, it has no soft component, such as the training of staff to ensure efficient work at the new OSBP facilities. The implementation of a separate project for staff training is, therefore, necessary so that the border control work by staff will be smoothly conducted at the new OSBP facilities.

3-2 Evaluation of the Project

3-2-1 Relevance

(1) Beneficiaries of the Project

As the Project aims at the renewal of border facilities and border-crossing bridge on the Central Corridor, its direct beneficiaries are people living along the 1,463 km long Central Corridor between Kigali in Rwanda and Dar es Salaam in Tanzania. Moreover, people of the Democratic Republic of Congo and Burundi on further stretches of this corridor will also feel the beneficial effects of the Project. Most of these residents are ordinary people engaged in agriculture and many can be classified in the category of rural poor.

(2) Purpose and Urgency of the Project

The purpose of the Project is to facilitate safe and steady physical distribution based on smooth traffic flow on the Central Corridor by means of constructing the new Rusumo Bridge and OSBP facilities to eliminate the current traffic restrictions and congestion of large vehicles at the Rusumo border post.

At present, the existing Rusumo Bridge is subject to traffic restrictions, such as the use of only one lane at a time, a maximum axle load of 8 tons and a maximum travelling speed of 5 km/hour. Its

early replacement has been called for in view of its major deflection under the weight of large passing vehicles. The existing border facilities are experience chronic traffic congestion, partly due to an insufficient number of parking spaces. This border crossing point has become a major bottleneck of the Central Corridor as it takes large vehicles an average of some 14 hours to complete the border crossing procedure. As the elimination of these problems is an urgent task for both countries, the urgency of the Project is quite high.

(3) Ease of Operation and Maintenance

While steel box girder construction is selected for the new Rusumo Bridge, careful consideration is given to the use of atmospheric corrosion-resistant steel so that the costly repainting of the steel girders will be unnecessary. The types of finishing materials for the new OSBP facilities are strictly limited in order to rationalise procurement, construction and maintenance.

(4) Achievement of the Targets of Medium and Long-Term Development Plans

The Transport Sector Policy of Rwanda sets out the programme for this sector for the period from 2008 to 2012. Its primary targets are reduction of the transportation cost through road improvement and stimulation of people's movement through the development of the nationwide road network. The policy refers to the existing plan for roads around Rusumo Bridge. Meanwhile, the Transport Sector Investment Programme (TSIP) of Tanzania aims at the improvement and better maintenance of international trunk roads and emphasises the construction, upgrading and proper maintenance of international corridors, including the Central Corridor. The Project will contribute to the achievement of these transport sector development targets of the two countries.

(5) Profitability

As the bridge, roads and OSBP facilities to be constructed under the Project do not aim at raising revenue by means of a user charge, etc., profitability in the post-project period cannot be discussed.

(6) Negative Environmental Impacts

As the Project intends the replacement of the existing bridge and improvement of the existing border facilities (to OSBP facilities) rather than the construction of completely new facilities, its impacts on the natural environment and social environment are inferred to be small. At the planning and design stages, such arrangements as the siting of the new Rwandan OSBP facilities at a distance of some 750 m away from the present site and the construction of a bypass road have been adopted to minimise the need for the resettlement of local residents. Moreover, in view of the proximity of the new OSBP facilities to Akagera River, waste water from the construction work and new OSBP facilities will be adequately treated prior to its discharge.

(7) Feasibility of the Project Under the Grant Aid Cooperation Scheme

While the Project will be the first project for the construction of OSBP facilities with Japan's grant aid, it is judged that its implementation will not involve any special difficulties because of the relatively simple structures of the planned bridge and buildings. As both countries are engaged in the work to introduce OSBP facilities in other areas with the assistance of other donors, the Project does not present them with any special difficulty.

(8) Necessity and Advantage of Using Japanese Technologies

The planned new Rusumo Bridge is located in rapids in the immediate downstream of Rusumo Falls. The impossibility of introducing bridge piers in the river means that the bridge must be a single span bridge with a length of 80 m. As neither Rwanda nor Tanzania possess the necessary technical capability to construct such a large bridge without external assistance, the use of Japan's technical capability for the planning, design and construction of this bridge is essential.

3-2-2 Effectiveness

The anticipated quantitative outputs of the implementation of the Project are explained below.

- The replacement of the bridge will make the permanent use of two lanes possible while increasing the axle load restriction from the present 8 tons to 20 tons and the speed limit from the present 5 km/hour to 30 km/hour.

- The introduction of new OSBP facilities means that it will be possible to complete the border crossing procedure at the entry side alone, shortening the overall time required to cross the border and alleviating the current congestion at the car parks. It is planned to shorten the border crossing time for large vehicles from Tanzania to Rwanda from some 14 hours to 5 ~ 10 hours. The integration of the customs clearance work, which is currently conducted at the Rusumo border and dry port in Kigali, at the new OSBP facilities at Rusumo will shorten the time by at least four hours.

- The shortening of the time to cross the border will reduce the overall transportation cost for a round trip between the Port of Dar es Salaam and Kigali for a 40 foot container from US$ 3,130 to US$ 3,050. This translates to an annual cost reduction of some US$ 1.8 million.

It will no longer be necessary for large vehicles with an axle load of 8 tons or more to take a detour to the Northern Corridor which involves an additional travelling distance of some 400 km (round trip transportation cost for a 40 foot container: US$ 4,352), reducing the transportation cost by US$ 1,220 for each 40 foot container.

Table 3-1 Quantitative Outputs

Indicator	Base (2010)	Target (2015)	Remarks
Traffic restrictions at Rusumo Bridge	Single land; maximum axle load of 8 tons; speed limit of 5 km/hour	Two lanes; maximum axle load of 20 tons; speed limit of 30 km/hour	
Time to complete the border crossing procedure	Approx. 14 hours	5 ~ 10 hours	
Cost of a round trip	US$ 3,130 for a 40 foot container	US$ 3,050 for a 40 foot container	Between the Port of Dar es Salaam and Kigali
Transportation cost for a large vehicle with an axle load of 8 tons or more	US$ 4,352 for a 40 foot container	US$ 3,050 for a 40 foot container	Change of the travelling route

(2) Qualitative Outputs

The anticipated qualitative outputs of the Project are described below.

- As safe and steady traffic flow will be secured together with smooth border crossing in the post-project period, the number of vehicles using the Central Corridor will increase, accelerating the overall improvement (at the Port of Dar es Salaam and road conditions along the entire route) of this corridor. This will have positive economic effects.

- For Rwanda, the availability of a reliable alternative route to the Northern Corridor (the value of border crossing cargo on the Rwandan side was US$ 14 million in 2007) means that physical distribution in Rwanda will become much more stable.

- The increase of the number of vehicles using the Central Corridor will level the international physical distribution which is currently over-dependent on the Northern Corridor. As a result, smoother physical distribution will be achieved throughout East Africa.

- The success of the Project will facilitate the introduction of OSBP facilities within the EAC.

- The number of accidents caused by congestion and parking at sloping sites will decrease.

- The availability of more PCs, peripheral devices, a forklift and other equipment will reduce the work burden of the staff, improving their work efficiency.

In addition to the positive outputs described above, the Project is expected to facilitate physical distribution on the Central Corridor with the opening of the new bridge and OSBP facilities and to stimulate the economic development of Rwanda and Tanzania. The successful implementation of the Project will be significant for Rwanda from the viewpoint of securing an alternative route to a port from this land-locked country. Both countries have expressed a strong urgency and necessity for the Project and Japanese assistance for the Project is judged to be highly significant, relevant and effective from the viewpoint of the purpose of Japan's ODA.

1. Member List of the Study team

1-1 First Site Survey（15th November, 2009～5th December, 2009）

（1） Team Leader：Masahiko SUZUKI（Project Formulation Advisor JICA）

（2） Project Coordinator：Kotaro NISHIGATA（Assistant Director for Transport & ICT Division 2, Economic Infrastructure Department, JICA）

（3） Chief Consultant/Bridge & Road Planner：Masahiko MORI（CHODAI CO., LTD.）

（4） Bridge Designer：Jun MORISHITA（CHODAI CO., LTD.）

（5） Architecture Planner：Jiro HONDA（Nippon Koei CO., LTD.）

（6） Equipment Planner：Hiroshi MIZUMASA（Nppon Koei CO., LTD.）

1-2 Second Site Survey（20th January, 2010～20th March, 2010）

（1） Team Leader：Masahiko SUZUKI（Project Formulation Advisor JICA）

（2） Project Coordinator：Kotaro NISHIGATA（Assistant Director for Transport & ICT Division 2, Economic Infrastructure Department, JICA）

（3） Chief Consultant/Bridge & Road Planner：Masahiko MORI（CHODAI CO., LTD.）

（4） Border Post Facilities Planner：Atsushi MORIOKA（Nippon Koei CO., LTD.）

（5） Bridge Designer：Jun MORISHITA（CHODAI CO., LTD.）

（6） Equipment Planner：Hiroshi MIZUMASA（Nppon Koei CO., LTD.）

（7） Natural Condition Suveyer：Shinji NARIYAMA（CHODAI CO., LTD.）

（8） Environment Specialist：Jyunko MASAKI（Nippon Koei CO., LTD.）

（9） Construction Planner／Cost Estimater：Tetsumi MASUI（CHODAI CO., LTD.）

1-3 Explanation of Design Policy Survey（7th June, 2010～13th June, 2010）

（1） Project Coordinator：Kotaro NISHIGATA（Assistant Director for Transport & ICT Division 2, Economic Infrastructure Department, JICA）

（2） Chief Consultant/Bridge & Road Planner：Masahiko MORI（CHODAI CO., LTD.）

（3） Architecture Planner：Jiro HONDA（Nippon Koei CO., LTD.）

1-4 Explanation on Draft Final Report（28th September, 2010～9th Octorber, 2010）

（1） Team Leader：Masahiko SUZUKI（Project Formulation Advisor JICA）

（2） Project Coordinator：Kotaro NISHIGATA（Assistant Director for Transport & ICT Division 2, Economic Infrastructure Department, JICA）

（3） Chief Consultant/Bridge & Road Planner：Masahiko MORI（CHODAI CO., LTD.）

（4） Architecture Planner：Jiro HONDA（Nippon Koei CO., LTD.）

2. Study Schedule

2-1 First Site Survey（15th November, 2009～5th December, 2009）

Date	JICA		Consultants			
	Team Reader Mr. Suzuki①	Project Cordinator Mr.Nishigata②	Chief Consultant Mr.Mori③	Bridge Design Mr.Morishita ④	Facility Design Mr.Honda⑤	Equipment Planning Mr.Mizumasa⑥
15-Nov (Sun)			NRT(1805)-BKK(2315)			
16-Nov (Mon)			BKK(0055)-NBO(625) NBO(0750)-JRO(0850)/KQ6724 10:30 Courtesy Call on EAC relevant departments			
17-Nov (Tue)			08:00 Meeting w/ CDC			
18-Nov (Wed)			Site Visit at Namanga Border Post			
19-Nov (Thu)			JRO(1030)-DAR(1235)/PW420 15:00 Meeting w/ Revenue Authority (TRA)			
20-Nov (Fri)			10:30 Meeting w/ JICA Tanzania Office 14:30 Meeting w/ TANROADS			
21-Nov (Sat)		HND(19:50)- KIX(21:10)/EK6257 KIX(23:20) -	Review of materials		Market Survey	
22-Nov (Sun)		DXB(5:40)/EK317 DXB(10:50)- DAR(15:20)/ EK725	Review of materials		Market Survey	
23-Nov (Mon)	09:00 Courtecy Call on MoID 10:00 Meeting with JTC members of Tanzania(atJICA) 13:00 Courtecy Call on TRA 16:00 Courtecy Call on TANROADS 17:00 Meeting w/ JICA Tanzania Office			Data collection (TRA & TANROADS) DAR(17:30)-NBO(20:30) /KQ6715 NBO(23:40)-		
24-Nov (Tue)	10:00 Meeting with JTC members of Tanzania(atJICA) 14:00 Report to JICA TZ Office 16:00 Courtesy Call on EoJ			KGL(0210)/KQ466 14:00 Meeting w/ Ministry of Infrastructure 16:00 Revenue Authority		
25-Nov (Wed)	DAR(05:10)-NBO(06:25)/ KQ481 NBO(08:10)-KGL(10:30)/ KQ468 16:00 Meeting w/ JICA Rwanda Office			Site Survey		
26-Nov (Thu)	09:00 Courtesy Call on Ministry of Infrastructure 11:30 Meeting w/NELSAP 14:00 Revenue Authority(RRA)			Site Survey		
27-Nov (Fri)	Discussion on M/M w/ MOI & RRA			Site Survey	Market Survey	
28-Nov (Sat)	Site Visit (Rsumo Bridge)			Site Survey	Market Survey	
29-Nov (Sun)	Site Visit at Nemba Border Post			KGL(900)-NBO(1130)/KQ477		
30-Nov (Mon)	Joint Technical Committee			13:30 DfID Nairobi Office		
1-Dec (Tue)	Signing of M/M (Joint Technical Committee) Report to JICA RW Office			NBO(2355)-BKK(1335)		
2-Dec (Wed)	KGL(11:20)-NBO(13:50)/KG468 Report to JICA Kenya Office			BKK(2300)-NRT		
3-Dec (Thu)		NBO(16:40) - DXB(22:40)/EK720	NBO(2355)- BKK(1335)	NRT(645)		
4-Dec (Fri)		DXB(03:30) - KIX(17:20)/EK316 KIX(18:45) - HND(19:55)/JL188	BKK(2300)-NRT			
5-Dec (Sat)			NRT(645)			

2-2 Second Site Survey (20th January, 2010～20th March, 2010)

Date	JICA		Consultants						
	Mr. Suzuki①	Mr.Nishigata②	Mr. Mori③	Mr.Morioka ④	Mr.Morishita ⑤	Mr.Mizumasa ⑥	Mr.Nariyama ⑦	Ms.Mazaki ⑧	Mr.Masui ⑨
20-Jan (Wed)							HND20:20－21:35KIX/QR4964-23:25－5:40DOR/QR821		
21-Jan (Thu)							DOH7:50-13:15NBO/QR532		
22-Jan (Fri)							NBO08:10-KGL10:30/KQ468 Visit JICA Office		
23-Jan (Sat)							Meeting with Contractors		
24-Jan (Sun)							Site Vsit		
25-Jan (Mon)							Site Visit		
26-Jan (Tue)							Meeting with Contractors		
27-Jan (Wed)							Meeting w/MININFRA Data cllection		
28-Jan (Thu)							Meeting w/MININFRA Data cllection		
29-Jan (Fri)							Meeting w/RRA Data cllection		
30-Jan (Sat)							11:20KGL-13:50NBO/KQ468-17:25-DAL18:40/KQ484		
31-Jan (Sun)			NRT18:05/JL707 - BKK23:15				Data study		HND20:20－21:35KIX/QR4964-23:25－
1-Feb (Mon)			BKK 01:05/EK385 DOR04:50				Visit JICA Office Meeting w/TRA		05:40DOH/QR821-07:30-13:25DOR/QR544
2-Feb (Tue)			JICA Tanzania				Meeting w/MOI Meeting w/TRA		Site Survey in Tanzania
3-Feb (Wed)			Explanation of draft idea to JTC members				Permission of work at boader		
4-Feb (Thu)			Paticipation in CDC W/S				Permission of work at boader		
5-Feb (Fri)			Paticipation in CDC W/S				15:00DAR-16:15NBO/KQ483-17:20-KGL17:45/KQ478		
6-Feb (Sat)		NRT1825 -	Paper work				Meeting with Contractors		
7-Feb (Sun)		/ JL 735 HNG2350 - JNB0715 / SA 287 JNB1030 - LUN1230	DAR 05:10/KQ481- NBO06:25 8:25/KQ724 - LUN10:05				Site visit preparation		
8-Feb (Mon)		Site Visit (Chirundu Border Post)					Survey & Investigation		
9-Feb (Tue)		LUN1105 - NBO1625 / KQ724					Survey & Investigation		DAR0510-NBO0625/KQ481 NBO0810-KGL0825/KQ448
10-Feb (Wed)	NBO0810 - KGL0835/ KQ 468 Meeting w/ JICA Rwanda Office Meeting w/ JTC Rwanda (Meeting w/ relevant organizations)						Survey & Investigation		Site Survey in Rwanda
11-Feb (Thu)	Meeting w/ JTC Rwanda (Meeting w/ relevant organizations)						Survey & Investigation		
12-Feb (Fri)	Meeting w/ JTC Rwanda Signning of M/D w/ Rwandan side Report to (EoJ and) JICA Rwanda Office						Survey & Investigation		
13-Feb (Sat)	KGL1545 - NBO1815/ KQ422						Survey & Investigation		
14-Feb (Sun)	Paper Work				HND20:20－21:35KIX/QR4964-23:25－		Survey & Investigation		
15-Feb (Mon)	Meeting w/ JICA Kenya Office Meeting w/ JICA Experts (Custom Project)				5:40DOR/QR821-7:55-13:15NBO/QR532		Survey & Investigation		
16-Feb (Tue)	NBO0805 - DAR0920 /KQ480 Meeting w/ JICA Tanzania Office				NBO8:10-8:35KGL/KQ448		Survey & Investigation		
17-Feb (Wed)	Meeting w/ JTC Tanzania (Meeting w/ relevant organizations)				Meeting w/MININFRA		Survey & Investigation		
18-Feb (Thu)	Meeting w/ JTC Tanzania (Meeting w/ relevant organizations)				Preparation traffic Survey	NRT18:05-BKK23:15 /JL707	Survey & Investigation	NRT18:05-BKK23:15 /JL707	
19-Feb (Fri)	Meeting w/ JTC Tanzania Signning of M/D w/ Tanzania side Report to JICA Tanzania Office and EoJ				Traffic Survey	BKK2:25-DBX5:55 /EK419 DBX10:45-NBO14:55/EK719	Survey & Investigation	BKK2:25-DBX5:55 /EK419 DBX10:45-NBO14:55/EK719	
20-Feb (Sat)		DAR1720 - DXB2350 /EK 726	DAR5:10 - NBO6:25/KQ481 NBO8:10 - KGL8:35 KQ448		Traffic Survey	NBO12:35-KGL14:55/KQ422	Survey & Investigation	NBO12:35-KGL14:55/KQ422	
21-Feb (Sun)		DBX0330 - KIX1720 / JL5090	Rusumo Site Survey		Analysisi the survey result	Site Survey	Survey & Investigation	Site Survey	
22-Feb (Mon)		KIX 1845- HND1955 / JL 188	Data Collection at Kigali		Data collection	Data collection	0:100KGL-05:40NBO/KQ446 14:15-19:10DOH/RQ533	Data collection	
23-Feb (Tue)			Data Collection at Kigali		Data collection	Data collection	00:50DOH-16:20KIX/QR820-18:15-19:25HND/JL186	Data collection	
24-Feb (Wed)			Data Collection at Kigali		Data collection	Data collection		Data collection	
25-Feb (Thu)			Data Collection at Kigali		Data collection	Data collection		Data collection	
26-Feb (Fri)			Data Collection at Kigali		Data collection	Data collection		Data collection	
27-Feb (Sat)			Lusumo Site Visit		Data collection	Data collection		Data collection	
28-Feb (Sun)			Lusumo Site Visit		Analysis the data	Analysis the data		Analysis the data	KGL1355-NBO1625/KQ448 NBO1725-DAR1840/KQ448
1-Mar (Mon)			Data Collection at Kigali		Data collection	Data collection		Data collection	
2-Mar (Tue)			KGL9:30-NBO13:50 /KQ448 NBO16:40-DOR22:40 /EK720	Data Collection at Kigali	Data collection	Data collection		Data collection	Site Survey in Tanzania
3-Mar (Wed)			DOR9:40-BKK18:40 /EK372 BKK23:00-	Data Collection at Kigali	KGL13:55-16:25/KQ473 NBO17:25-18:40DAR/KQ484	Data collection		Data collection	
4-Mar (Thu)			NRT6:45 /JL718	KGL9:30-NBO13:50/KQ448 NBO16:40-DOR22:40/EK720	Data collection	KGL1355-1625/KQ473 NBO1725-1840DAR/KQ484		KGL1355-1625/KQ473 NBO1725-1840DAR/KQ484	DAR14:25-19:55DOR/QR545
5-Mar (Fri)				DOR9:40-BKK18:40 /EK327 BKK23:00-	Data collection	Data collection		Data collection	DOR00:50-16:20KIX/QR820 KIX18:15-19:25HND/JL186
6-Mar (Sat)				NRT6:45 /JL718	Data collection	Data collection		Data collection	
7-Mar (Sun)					Analysis the data	Data collection		Data collection	
8-Mar (Mon)					Data collection	Data collection		Data collection	
9-Mar (Tue)					Data collection	DAR1720-DBX2350/EK726		DAR1720-DBX2350/EK726	
10-Mar (Wed)					Data collection	DBX0315-BKK1205/EK384 BKK2300-		DBX0315-BKK1205/EK384 BKK2300-	
11-Mar (Thu)					Data collection	NRT0645/JL718		NRT0645/JL718	
12-Mar (Fri)					Data collection				
13-Mar (Sat)					Data collection				
14-Mar (Sun)					Analysis the data				
15-Mar (Mon)					Analysis the data				
16-Mar (Tue)					Data collection				
17-Mar (Wed)					Data collection				
18-Mar (Thu)					Data collection				
19-Mar (Fri)					DAR14:25-19:55DOR/QR545				
20-Mar (Sat)					DOR00:50-16:20KIX/QR820 KIX18:15-19:25HND/JL186				
21-Mar (Sun)									

2-3 Explanation of Design Policy Survey (7th June, 2010～13th June, 2010)

Date	JICA	Consultants		Accommodation
	Mr. Nishigata①	Mr.Mori②	Mr.Honda③	
7-Jun (Mon)	Tokyo(21:40)→			
8-Jun (Tue)	Dubai(03:30)/EK319 Dubai(10:45)→Nairobi(14:45)/ EK719			
	Nairobi(18:00)→Kigali(18:15)/ WB118			Kigali
9-Jun (Wed)	08:00 Meeting w/ JICA Rwanda Office 10:00 Meeting w/ JTC (3rd JTC Meeting) 17:00 JICA Rwanda Office			Kigali
10-Jun (Thu)	9:00 Meeting w/ JTC (3rd JTC Meeting)			Kigali
11-Jun (Fri)	Preparation of Technical Note JTC Minutes and Technical Note Signing Rusumo Site Visit			Kigali
12-Jun (Sat)	Kigali(09:30)→Nairobi(13:50)/KQ448 Nairobi(16:40)→Dubai(22:40)/ EK720			
13-Jun (Sun)	Dubai(03:15)→Tokyo(18:00)/ EK318			

2-4 Explanation on Draft Final Report (28th September, 2010～9th Octorber, 2010)

Date	JICA		Consultants	Accommodation
	Mr. Suzuki①	Mr.Nishigata②	Mr. Mori③、Mr.Honda④	
28-Sep (Tue)		Tokyo(20:50)→		
29-Sep (Wed)		Doha(05:15)/QR803 Doha(07:20)→Dar-es-Salaam(13:05) /QR544		
	Dar-es-Salaam(16:30)→Kilimanjaro(17:50)/PW432			Arusha
30-Sep (Thu)	4th JTC meeting (Discussion on draft report) Meeting w/ JTC Rwanda (Explanation of draft report)			Arusha
1-Oct (Fri)	4th JTC meeting (M/D discussion & singing of M/D)			Arusha
2-Oct (Sat)	Kilimanjaro(15:30)→Nairobi(16:30)/ PW727			Nairobi
3-Oct (Sun)	Documentation			Nairobi
4-Oct (Mon)	am or pm Meeting w/ JICA Kenya Office Nairobi(12:30)→Kigali(12:55)/ KQ472 Meeting w/ JICA Rwanda Office			Kigali
5-Oct (Tue)	Explanation to PS of MinInfra & Signing of M/D Meeting on EIA issues (w/ MinInfra and RDB) Courtesy Call on EoJ (if necessary)			Kigali
6-Oct (Wed)	Kigali(13:45)→Nairobi(16:15)/ KQ473 Nairobi(17:25)→Dar-es-Salaam(18:40)/ KQ484			Dar-es-Salaam
7-Oct (Thu)	Signing of M/D Report to JICA Tanzania Office Courtesy Call on EoJ			Dar-es-Salaam
8-Oct (Fri)	Dar-es-Salaam(14:25)→Doha(20:00)/ QR545			
9-Oct (Sat)	Doha(01:05)→Narita(19:30)/ QR802			

3. List of Parties Concerned in the Recipient Country

Tanzania Embassy of Japan
- Mr. Taira NAKAGAWA — Ambassador
- Mr. Yukinori SEKI — Second Secretary

Rwanda Embassy of Japan
- Mr. Kunio HATANAKA — Ambassador
- Mr. Shigeru KONDO — Counselor

JICA Tanzania Office
- Mr. Hideyuki KATSUTA — Director
- Mr. HASEGAWA — Deputy Director
- Mr. Shin MARUO

JICA Rwanda Office
- Mr. Hiroshi MURAKAMI — Director
- Mr. KIKUCHI
- Mr. Samuel Sangwa

JICA Kenya Office
- Mr. Katsuyuki TAKAHASHI — Director
- Mr. Yoshiro KURASHINA — Depty Director
- Mr. Tomohiko ISHIKAWA

JICA Zambia Office
- Mr. SATO
- Mr. Kabila Ilubala

East Africa Custom Project Expert
- Mr. URAKAWA — Expert
- Mr. IWAI — Expert

Ministry of Infrastructure, Rwanda : MININFRA
- Ms. Marie C. Mukasine, Permanent Secretary
- Mr. Alexis Karani, Adviser to the Minister of State
- Mr. Watson Ngambi,
- Mr. Amil Miyanadeniya,
- Mr. Honore Munyashongore,
- Mr. Bariga Saleh

Ministry of Infrastructure, Rwanda Building Department
- Mr. Rumomuriza Dhanis,
- Mr. Kayighna Remmy,

Rwanda Revenue Authority: RRA
- Ms. Mary Baine, Commissioner General
- Mr. Chris Hakiza, Head of Operations Policy & Business Development Division
- Ms. Mujawayew Basilisse
- Mr. Paul Kayitere

Rwanda General Directorate of Immigration and Emigration
- Mr. Theodore Mutabazi

Rwanda Development Board
- Mr. Theobald Nyatanyi Mashinga

Ministry of Infrastructure Development, Tanzania : MOID
Mr. Omar A. Chambo, Permanent Secretary
Mr. Patrick Mfugale,
Mr. Stanford Makala,

TANROADS (Tanzania National Roads Authority)
Mr. Jason Rwiza, Director of Planning
Mr. Johnny Kalupale, Kagera Region
Mr. Ebenezer R. Mollel

Tanzania Revenue Authority: TRA
Mr. Burton Kaissy, Senior Customs Manager
Mr. Chanrembo Kihombo, Compliant traders' scheme

Ministry of Home Affairs, Immigration Department
Mr. Rasheed S. Magetta

Tanzania Building Agency
Mr. Makunba T. Kimweri
Mr. Audax S.L.Ngimbwa

East African Community : EAC
Mr. Kenneth Bagamuhunda, Director Customs
Mr. Philip W. Wambugu, Director Planning and Infrastructure
Mr. Gratian Rutaserwa, Senior Materials/Pavement Engineer
Ms. Tomomi Tokuori, JICA Advisor to the Directorate of Planning and Infrastructure

Zambia Revenue Authority : ZRA
Mr. Arnold Nkoma

Ministry of Home Affairs Immigration Department
Mr. Kalubeto Obed

DfID (Department for International Development)
Mr. Graham Johnson, Customs, Excise and VAT

The World Bank
Mr. Satoru Ueda, Land Water Resouces Specialist
Ms. Brooke Yamakoshi, Operations Analyst