GENERAL CORPORATION FOR ROAD & BRIDGES
MINISTRY OF PUBLIC WORKS AND HIGHWAYS
REPUBLIC OF YEMEN

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR UPGRADING AND REVITALIZATION OF ROAD CONSTRUCTION MACHINERY WORKSHOP AT NUKUM
IN
REPUBLIC OF YEMEN

March 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL

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PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey on the Project for Upgrading and Revitalization of Road Construction Machinery Workshop at Nukum in the Republic of Yemen.

JICA sent to Yemen a survey team from Oct. 6th to Nov. 2nd, 2009.

The team held discussions with the officials concerned of the Government of Yemen, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Yemen in order to discuss a draft outline design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Yemen for their close cooperation extended to the teams.

March, 2010

Kiyofumi Konishi
Director General, Economic Infrastructure Department
Japan International Cooperation Agency

March, 2010

Letter of Transmittal

We are pleased to submit to you the preparatory survey report on the Project for Upgrading and Revitalization of Road Construction Machinery Workshop at Nukum in the Republic of Yemen.

This survey was conducted by Katahira & Engineers International, under a contract to JICA, during the period from September, 2009 to March, 2010. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Yemen and formulated the most appropriate outline design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Hiroshi Honda
Project manager,
Preparatory Survey team on the Project
for Upgrading and Revitalization of Road
Construction Machinery Workshop at Nukum
Katahira & Engineers International

SUMMARY

1. Outline of the Country

The Republic of Yemen is a country located at 12-20° N 41-54° E, and in the southwest most of the Arabian Peninsula. It is in some 528,000 km^2 in land area, about one and a half times as large as Japan, including over 200 islands, though there are some undefined borders. It is facing Ethiopia, Djibouti, Somalia and Eritrea across the sea and adjacent to Saudi Arabia in the north and Oman in the east. The population of Republic of Yemen was approximately 22 million as of 2006, the country has the second largest population in the gulf region next to Saudi Arabia. The climate of the country is very diverse from the tropical to temperate zone, and annual average precipitation is approximately 100mm. The capital of the country, Sana'a, where the Nukum Road Construction Machinery Workshop is located, is in the central highlands, which are temperate area – cool in summer and warm in winter with the mild humidity – and are known for its comfortable climate for a place in the Arabian Peninsula.

2. Background of the Project

In the Republic of Yemen, there is no means of land transportations other than road transportation, and thus roads are indispensable infrastructures for improvement of accessibility to social services and the vitalization of economic activities. However, its precipitous geography makes it difficult to proceed smoothly with road construction; the proportion of paved road to the national road network as a whole remained a mere 24% (in 2008), and some 75% of the people in rural areas claimed (in 1999) that unpaved roads made it difficult to visit health and medical facilities. Throughout the country, the roadway infrastructure is underdeveloped.

In such circumstances, the Ministry of Public Works & Highways (MPWH), the ministry presiding over the development of road network, has been striving for an expansion of the road construction in accordance with the Third Socio-Economic Development Plan for Poverty Reduction (DPPR) and the Third Five-Year Plan (2006-2010) which is more specific than the Third DPPR. Despite these, it has achieved a mere 50% of the target set (in 2006) in the road construction plan of the Third Five-Year Plan – 814km out of the targeted 1,550km.

A General Corporation for Road & Bridge (GCRB), one of the largest actors for road construction, plays a crucial role as an affiliated to MPWH in the road construction in Yemen as a whole with the Nukum Road Construction Machinery Workshop at its center which is a sole repairing factory for road construction equipment build via Japan's Grant Aid scheme. However, although the Workshop is committed appropriately to the maintenance and management, a large number of facilities and pieces of machinery are still being used beyond their service life, and fairly decrepit, so that the Workshop is incapable of repairing or maintaining even a half of equipment requiring repair or maintenance (as planned). In other words, it faces the problem of failing to satisfy the demand for road improvement.

The Nukum Road Construction Machinery Workshop, built in 1994 with Japan's Grant Aid Program "Establishment of the Workshop for Road Construction Machinery", has considerably contributed to the improvement of road network nationwide in Republic of Yemen. (The Workshop is involved in the development of some 3,000km-long national road network and some 12,800km-long rural road network.) However, 15 years have elapsed since then: the machinery then purchased has become decrepit, and the operating rate of road construction equipment has been falling considerably. In line with this, the Government of Republic of Yemen has requested the Government of Japan to cooperate concerning the upgrading of some machineries and facilities of the Workshop in order to proceed with the maintenance and development of the road network as planned.

The aims of this Project are to upgrade and enhance the facilities and machineries of the Nukum Road Construction Machinery Workshop in such circumstances, improve the capability of repairing and maintaining construction equipment, turn around the operating rate of the construction equipment, and then encourage the development of the road network of the country.

3. The Result of the Survey Results and Contents of the Project

JICA, in order to investigate the necessity and adequacy of the request, dispatched a preparatory survey (outline design survey) team during the period of October 5 and November 3, 2009, and, and again a preparatory survey team (briefing survey for outline design) during the period of January 16 and 25, 2010, so as to give an explanation of the result of the investigations made in Japan.

During the field survey period of the preparatory survey, GCRB submitted the final request as shown in the following table.

Category	Section / region	No. of items
Machineries for Nukum Road Construction Machinery Workshop	Engine section	34
	Fuel pump section	4
	Electric section	1
	Hydraulic section	14
	Machine section	25
	Welding section	2
	Chassis section	33
	Tire section	5
	General machines	56
Road construction equipment	Regions subject to disputes and floods (A)	8 (18 units)
	Other regions (B)	7 (15 units)
	Other regions (c)	9 (27 units)

Taking the final request back to Japan, the allocation of repairing and maintenance machinery and the Soft Component (Technical Assistance) will be planned for the Nukum Road Construction Machinery Workshop to raise the number of usable machines to 820 from 620.

Machineries to be procured will be confined to items required by the Nukum Road Construction Machinery Workshop only, thus not including any road construction equipment. Where the allocation of items for repairing and maintenance machineries is concerned, model and the number of items will be examined which will be able to fill in the gap between the demand for repairing and maintenance machinery and the current capability of the Workshop: some items will be upgraded, others will be added or repaired. As for repair of the existing items, it is considered that the Workshop is able to handle in line with its own routine work, so that the cost will not be borne by the Japanese side.

The results of examinations concerning equipment to be procured are shown below.

Section	No. of items of machinery to be procured	Summary of machinery to be procured
1. Engine Section	29	As for cylinder drilling machines, crankshaft grinders, etc., the existing machines will be repaired and continue to be used. Turning devices for sleeve counter bore, cylinder head and cylinder block pressure testers and other machines, with which the section is not equipped at the moment, will be procured.
2. Fuel Injection Pump Section	4	12-cylinder pump testers (currently, 6-cylinder testers are in possession) and Cummins PT pump testers (for KOMATSU machines) will be newly procured, so as to conduct the maintenance work for pumps of all major construction machines.
3. Electric Section	1	Battery chargers will be procured to replace the current, decrepit ones.
4. Hydraulic Section	13	Gauges and testers, and grinding machines will be procured and used with the existing machines so as to improve the work efficiency.
5. Machine Section	25	Gauges and testers, decrepit large machine tools (lathes, milling machines, etc.) which has problems in their precision, and accessories and tools
6. Welding Section	3	Radiator repair stands with accessories, automatic gas welding machines and cranes (the welding machines will be included in "9. General Workshop Equipment") which the section does not own and thus outsources the relevant work.
7. Chassis Section	32	Automatic welding machines and accessories for underbody of crawler machines which the section does not own; overhead traveling cranes to replace the current ones which may not be safe; and other devices will be procured.
8. Tire Section	6	Automatic tire changers (for large, medium, and small sized vehicles) and accessories, which are not in possession, will be procured.
9. General Wprkshops Equipments Section	64	Trailers, forklifts and other machines to carry in and out faulty machines, and transfer materials and equipment; mobile workshops and lubrication trucks for on-site maintenance and repairing to reduce the burden of the Center; and generators, transformers and other factory facilities to make up for the shortage of electric capacity will be procured.

4. Operation Plan and Cost Estimation of the Project

As for the time required to implement this Project, it is considered to take a total of 15 months: 4 months for implementation design; 6 months for production of equipment; 2 months for transportation; and 3 months for installation, adjustment, test operations, assistance to start-up operations, and soft component.

The Project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note (E/N) for the Project.

5. Project Evaluation and Recommendations

This Project is planned to upgrade and develop the facilities and achineries for repairing and maintenance of road construction equipment at the Nukum Road Construction Machinery Workshop built in 1994 via Japan's Grant Aid scheme, and to increase the number of road construction equipment owned by GCRB from the current 620 (62%) to 800 (80%). The improvement of the capability for repairing and maintaining road construction equipment, and the subsequent increase in their operating rate will contribute substantially to the development of road network across the country. At the same time, a contribution to the road construction which is considered to be the most fundamental infrastructure in Republic of Yemen, a sole least less-developed country in the Middle East, will promote the improvement of access among the people to the medical, educational and various other social services, so that it is considered reasonable to implement this Project under Japan's Grant Aid scheme.

In order to make effective and maximum use of road construction equipment and to contribute greatly to development of the road network, it is essential, not just to restore the function of the Workshop, to enhance the management capability of GCRB, which owns the equipment and is responsible for actual road work, to draw up accurate implementation plans of each fiscal year including equipment development and allocation plans.

موجز المشروع

1. لمحة عامة عن الجمهورية اليمنية

الجمهورية اليمنية تقع في جنوب غرب شبه الجزيرة العربية بين خطي عرض 12 درجة و 20 درجة شمال خط الاستواء، وبين خطي طول 41 درجة و54 درجة شرق جرينتش. وهي تتضمن أكثر من 200 جزيرة، وتبلغ مساحتها 528 ألف كيلومتر مربع، بما يمثل حوالي مرة ونصف مساحة اليابان. تطل الجمهورية اليمنية من الناحية البحرية على الدول الأفريقية التالية، اثيوبيا، جيبوتي, الصومال، اريتريا، ويحدها من الشمال المملكة العربية السعودية ومن الشرق سلطنة عمان. بلغ تعداد سكان الجمهورية اليمنية 22 مليون نسمة عام 2006، وتعتبر الدولة الثانية في منطقة الخليج بعد المملكة العربية السعودية من حيث عدد السكان. أما بالنسبة للمناخ في الجمهورية اليمنية فانه يتنوع من منطقة استوائية الى منطقة معتدلة، ويبلغ معدل سقوط الامطار السنوي حوالي 100 مم. تقع ورشة نقم المركزية لإصلاح وصيانة معدات شق الطرق في منطقة مرتفعة من العاصمة صنعاء تتميز بطقس معتدل، غير حار صيفاً ومعتدل شتاءً مع انخفاض معدل الرطوبة في فصل الصيف مما يجعلها تتميز بطقس معتدل في منطقة شبه الجزيرة العربية.

2. لمحة عامة عن المشروع

النقل البري في الجمهورية اليمنية هو الوسيلة الأساسية للانتقال، ويعتبر البنية التحتية التي لاغنى عنها للوصول الى الخدمات الاجتماعية وتفعيل النشاط الاقتصادي في البلاد. لكن نظراً لصعوبة التضاريس في الجمهورية اليمنية، لم يحدث تقدم كبير في عملية صيانة الطرق واقتصرت نسبة تمهيد الطرق على 24% (عام 2008) من اجمالي شبكة الطرق في البلاد، بل وأصبح من الصعب على 75% من المواطنين المحليين الوصول الى الخدمات الاجتماعية التي يحتاجونها مثل مرافق الرعاية الصحية (عام 1999) وذلك بسبب تأخر عملية تمهيد الطرق في مختلف أنحاء الجمهورية.

لهذا وضعت وزارة الأشغال العامة والطرق (MPWH) التي تعتبر الجهة المنوط بها صيانة وشق الطرق خطة خمسية ثالثة للتنمية الاقتصادية ومكافحة الفقر المعروفة باسم (DPPR) في الفترة (2006-2010) حيث تم تحديد المستهدف بدقة في هذه الخطة من أجل تطوير شبكة الطرق وصيانتها. لكن هذه الخطة الخمسية الثالثة لم تحقق سوى 50% من المستهدف حيث تم تطوير 814 كم من اجمالي الخطة المستهدفة وهي 1550 كم (عام 2006).

المؤسسة العامة للطرق والجسور **(GCRB)** التابعة لوزارة الأشغال العامة والطرق **(MPWH)** هي المسئولة عن شق الطرق وصيانتها على مستوى الجمهورية اليمنية. وقد تم بناء ورشة نقم المركزية لإصلاح وصيانة معدات شق الطرق بمنحة من الحكومة اليابانية، حيث لعب المركز دوراً هاماً في تطوير شبكة الطرق في الجمهورية اليمنية. لكن مع مرور الوقت، وصلت الآلات والمعدات إلى نهاية عمرها الافتراضي، وانخفض معدل تشغيلها وزادت نسبة الأعطال ولم تعد قادرة على تنفيذ مهام الصيانة، وانخفضت كفاءة الورشة إلى أقل من 50%. لهذا فإن الورشة المركزية تواجه التحدي المتمثل في عدم استطاعتها مواكبة الطلب على صيانة الطرق بكفاءة.

تم إنشاء ورشة نقم المركزية لإصلاح وصيانة معدات شق الطرق عام 1994 بمنحة من الحكومة اليابانية، حيث أسهمت بشكل كبير في تطوير شبكة الطرق على مستوى الجمهورية اليمنية (حيث ساهمت الورشة في إصلاح وصيانة 3000 كم من

الطرق الرئيسية و 12800 كم من الطرق المحلية.) لكن بعد مرور 15 سنة على انشاء المركز، تدهور أداء المعدات والآلات مقارنة مع بداية تشغليها، وانخفضت كفاءتها بشكل ملحوظ. لهذا طلبت حكومة الجمهورية اليمنية من الحكومة اليابانية مساعدتها في المضي قدما نحو تنفيد خطة تشييد البنية التحية للطرق عن طريق تحديث الآلات والمعدات في ورشة نقم.

هذا المشروع، يهدف الى تجديد الآلات والأدوات وتدعيم ورشة نقم المركزية لإصلاح وصيانة معدات شق الطرق من أجل تحسين معدل تشغيل المعدات وبالتالي تعزيز خطة صيانة شبكة الطرق في الجمهورية اليمنية.

3. الخطوط العريضة لنتائج الدراسة ومحتويات المشروع

قامت الجايكا بإرسال فريق بحث (دراسة الخطوط العامة) في الفترة من 5 أكتوبر الى 3 نوفمبر عام 2009 للنظر في أسباب تقديم الطلب ومدى جديته، ثم أوفدت فريق الدراسة (شرح الخطوط العامة للمشروع) في الفترة من 16 يناير الى 25 يناير عام 2010 لشرح النتائج التي توصلت اليها الدراسات..

وقد تسلم فريق البحث خلال الزيارة الميدانية قائمة بأسماء المعدات والأدوات المبينة في الجدول أدناه كطلب نهائي من المؤسسة العامة للطرق والجسور (**GCRB**)

تصنيف	القسم.المنطقة	العدد
الآلات لمركز نقم لإصلاح معدات شق الطرق	قسم المحركات	34
	قسم مضخات الوقود	4
	قسم الكهرباء	1
	لقسم الهيدروليك	14
	قسم المخارط	25
	قسم اللحام	2
	قسم الهياكل	33
	قسم الإطارات	5
	آلات عامة	56
معدات بناء الطرق	منطقة متضررة من الصراعات الإقليمية والفيضانات (A)	8 (18 وحدة)
	مناطق أخرى (B)	7 (15 وحدة)
	مناطق أخرى (C)	9 (27 وحدة)

تم احضار هذا الطلب الى اليابان لتنفيذ خطة إصلاح معدات شق الطرق، وماكينات الصيانة، توفير التدريب الضروري للورشة بهدف زيادة عدد المعدات القابلة من 620 وحدة حالياً إلى 820 وحدة.
بالنسبة لإمداد الآلات والمعدات، سيقتصر على توفيرالماكينات والآلات اللازمة لورشة نقم لإصلاح معدات شق الطرق، مع استبعاد معدات بناء الطرق. أما الترتيبات الخاصة بالآلات اللازمة لإصلاح معدات شق الطرق، سيتم دراسة نوع وكمية

الآلات التي تفي بغرض صيانة المعدات لسد الفجوة التي نشأت من عدم قدرة الورشة على الإصلاح وذلك من أجل استعادة قدرة الورشة وتعزيز إمكانياتها. ويعتقد أنه يمكن الحفاظ على مستوى العمل في مركز نقم لإصلاح معدات شق الطرق بدون اضافة أعباء اضافية على اليابان.

والجدول الموضح أدناه يبين نتيجة مراجعة المعدات التي تقررت.

القسم	عدد المعدات	نبذة مختصرة عن المعدات
1. قسم المحركات	**29**	**أجهزة لصيانة المعدات الموجودة في المرافق الحالية مثل مثقاب اسطواني، تجليخ عمود المحرك وهي المعدات اللازمة لأعمال القطع والثقب واختبار قياس ضغط رأس الاسطوانة وهذه المعدات غير متوافرة بعد.**
2. قسم مضخات حقن الوقود	**4**	**ماكينة اختبار مضخة 12 اسطوانة (حالياً ماكينة اختبار مضخة 6 إسطوانات) مع معدات اختبار مضخة كومينز (شركة كوماتسو لمعدات البناء)، وذلك من أجل صيانة جميع المضخات معدات البناء.**
3. قسم الكهرباء	**1**	**توفير شاحن للبطاريات للإحلال محل الشاحن القديم الذي انتهت صلاحيته**
4. قسم الهيدروليكي	**13**	**معدات اختبار مع ماكينات تجليخ تعمل جنباً الى جنب مع المعدات الحالية لتحسين كفاءة العمل.**
5.قسم الماكينات	**25**	**اكينات القياس والفحص والماكينات ذات الحجم الكبير (مخارط، مثقال، الخ) التي تؤثر بشكل كبير على المنتج النهائي وأجزاء الماكينات المساعدة.**
6. قسم اللحام	**3**	**حوامل اصلاح الراديتور الغير متوافرة، أجهزة لحام الاكسجين الاوتوماتيكية، رافعة (من أجل أجهزة لحام 9 الموجودة في المرفق)**
7. قسم الهياكل	**32**	**آلات لحام اوتوماتيكية ومعدات ومواد أخرى ضرورية لتنفيذ أعمال الصيانة الخاصة بالأجزاء السفلية من ماكينات شق الطرق من النوع الزاحف، روافع مغطاة للأعمال الخارجية توفر عنصر الأمان.**
8. قسم الإطارات	**6**	**ماكينات أوتوماتيكية لنزع الإطارات وإعادة تركيبها الغير متوافرة (حجم كبير، حجم متوسط، حجم صغير) والمعدات والآلات الفرعية المتعلقة بها.**
9. معدات المصنع	**64**	**مسيارات العمل الخارجية لنقل المولدات والمحولات الكهربائية وغيرها من المعدات الضرورية لتنفيذ أعمال صيانة معدات البناء في موقعها لتقليل نفقات ارسال المقطورات والروافع لسحب تلك المعدات الى المركز لإصلاحها واعادتها مرة أخرى لمواقع العمل.**

4. الفترة الزمنية لتنفيذ المشروع وتكاليفه

يتوقع أن يستغرق تنفيذ المشروع 15 شهراً، حيث يستغرق تنفيذ التصميمات 4 أشهر، تصنيع الماكينات والمعدات 6 أشهر، شهران لنقل المعدات، و3 أشهر لعمليات التركيب والضبط والاختبار والتدريب على التشغيل الأولي والتدريب.

سيتم تنفيذ المشروع وفقاً لبرنامج المنح الياباني، وسيتم تحديد التكلفة قبل ابرام مذكرة التبادل (E/N) الخاصة بالمشروع.

5. دراسة صلاحية المشروع

هذا المشروع يهدف الى تحديث ودعم عملية اصلاح معدات شق الطرق وصيانة الآلات والمعدات الخاصة بالورشة المركزية والتي أنشأت بمنحة من حكومة اليابان عام 1994, من أجل رفع كفاءة المعدات التي تملكها المؤسسة العامة للطرق والجسور **GCRB** من 620 وحدة (62%) الى 800 وحدة (80%). وهذا من شأنه أن يؤدي الى تحسين فعالية معدات شق الطرق والقدرة على صيانتها، وسوف يسهم ذلك في صيانة شبكات الطرق في كافة أنحاء الجمهورية اليمنية. بالإضافة لذلك، فإن هذا المشروع سيساهم في تحسين الوصول الى الخدمات الاجتماعية والصحية والتعليم وغيرها من الخدمات، لأن هذا

المشروع سوف يساعد على دعم البنية التحتية لصيانة الطرق في "اليمن" التي تعتبر من أكثر دول الشرق الأوسط احتياجاً للمساعدة، ويمكن اعتبار أن هذه المعونة التي تقدمها الحكومة اليابانية تستخدم في الاتجاه الصحيح الذي يهدف الى زيادة التعاون الاقتصادي المحمود لليابان.

علاوة على ذلك، تجدر الإشارة الى أهمية تعزيز مجال الإدارة الذي من شأنه أن يؤدي الى تطوير خطة صيانة الماكينات والمعدات، وتنفيذ الخطة في السنة المالية من قبل المؤسسة العامة للطرق والجسور **GCRB** التي تملك معدات شق الطرق وصيانتها، وأيضاً تعزيز الوظائف في مركز نقم لصيانة معدات شق الطرق ووضع الخطة موضع التنفيذ لاستخدام معدات شق الطرق في الأغراض المعدة من أجلها.

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR UPGRADING AND REVITALIZATION OF ROAD CONSTRUCTION MACHINERY WORKSHOP AT NUKUM
IN
REPUBLIC OF YEMEN

PREFACE
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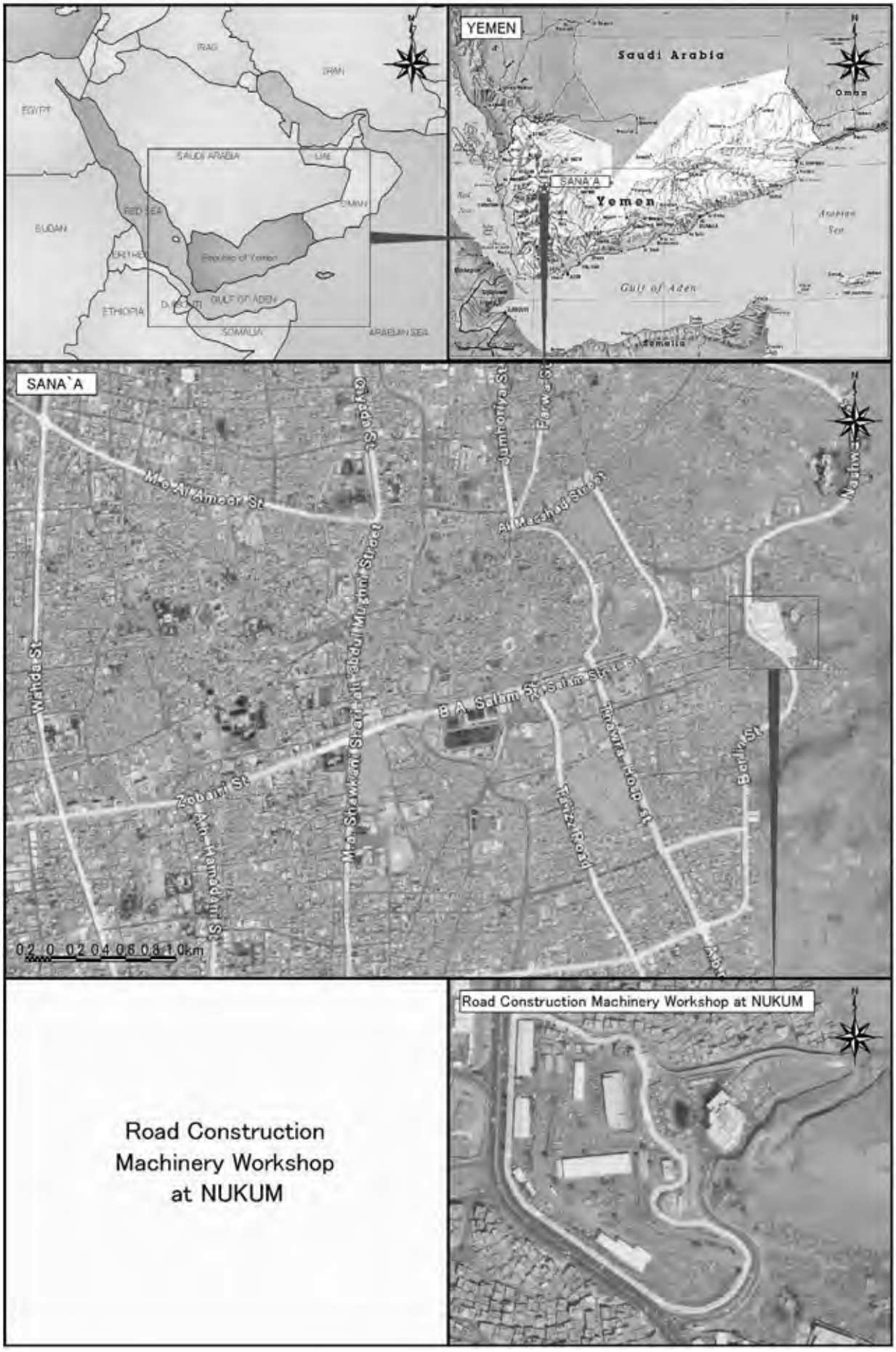


Road Construction
Machinery Workshop
at NUKUM

LOCATION MAP

LIST OF FIGURES AND TABLES

ABBREVIATIONS

AC	Alternating Current
CIF	Cost, Insurance, and Freight
DPPR	Development Plan for Poverty Reduction
E/N	Exchange of Note
GCC	Gulf Coast Conference
GCRB	General Corporation for Road & Bridge
GDP	Gross Domestic Product
GNI	Gross National Income
MPIC	Ministry of Planning & International Cooperation
MPWH	Ministry of Public Works & Highways
OJT	On the Job Training
PIP	Public Investment Plan
RMF	Road Maintenance Fund
UAE	United Arab Emirates
WB	The World Bank
WD	Wheel Drive
YR	Yemen Rial

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 BACKGROUND OF THE REQUEST

Nukum Road Construction Machinery Workshop, built in 1994 with Japan's Grant Aid Program "Establishment of the Workshop for Road Construction Machinery in the Republic of Yemen", has considerably contributed to the improvement of road network nationwide in Republic of Yemen. (The Workshop is involved in the development of some 3,000km-long national road network and some 12,800km-long rural road network.) However, now that 15 years have elapsed since then, the repairing machineries then purchased have become decrepit and the annual number of construction equipment in good repair has been decreasing, leading to considerable decrease of the operating rate of road construction machines. In line with this, the Government of Republic of Yemen has requested Japanese Government's cooperation concerning the upgrading of some machineries and facilities of the Workshop in order to proceed with the maintenance and development of the road network as planned.

Under these circumstances, the aims of this Project are to upgrade and enhance the facilities and machineries of the Nukum Road Construction Machinery Workshop, improve the capability of repairing and maintaining construction equipment, turn around the operating rate of the construction equipment, and then encourage the development of the road network of the country.

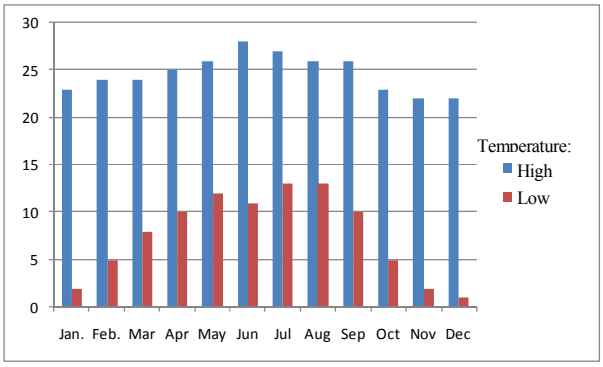
1-2 NATURAL CONDITIONS

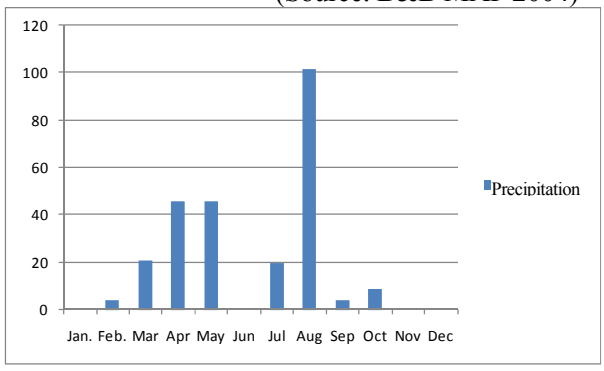
The Republic of Yemen is a country located at 12-20° N 41-54° E, and in the southwestmost of the Arabian Peninsula. It is in some 528,000 km^2 in land area, about one and a half times as large as Japan, including over 200 islands, though there are some undefined borders. It is facing Ethiopia, Djibouti, Somalia and Eritrea across the sea and adjacent to Saudi Arabia in the north and Oman in the east.

According to the standard climatic division, the climate of Republic of Yemen, of which land is dominated by precipitous mountainous terrains in all parts of the country, is very diverse from the tropical to temperate zone. The western and the southern coastal regions, for example, are tropical and the temperature difference throughout the year is substantial (20 – 50℃), while the annual average temperature is 32℃, with high humidity (the humidity may reach 100%). The capital of the country, Sana'a, where the Nukum Road Construction Machinery Workshop is located, is in the central highlands, which are temperate area – cool in summer and warm in winter with the mild humidity – and are known for its comfortable climate for a place in the Arabian Peninsula. Even so, the precipitation is high and there are quite a few places where it exceeds 1,000mm (Ta'izz and elsewhere). The monthly average high/low temperatures and monthly average precipitation in Sana'a are shown in Table 1-2-1.

Table 1-2-1 Monthly Average High/Low Temperatures and Monthly Average Precipitation in Sana'a

(Source: B&B MAP 2004)





1-3 OTHERS

This Project aims at the extension and renovation of some facilities, and the upgrading and enhancing of existing machineries of the Nukum Road Construction Machinery Workshop. It is considered that an impact on the surrounding environments – vibration and noise arising from the delivery and moving of facilities – will be fairly minimal on the grounds that the noise which may arise during the implementation of the Project is limited, and that there are no residential areas near the Project site.

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

In Republic of Yemen (hereinafter called to as “Republic of Yemen”), there is no means of land transportations other than road transportation, and thus roads are indispensable infrastructures for improvement of accessibility to social services and the vitalization of economic activities. Thus, the Government of Republic of Yemen has been striving for the completion of paving work (a total of 19,107km) and construction of unpaved roads (a total of 13,412km) by 2010 in accordance with the Third Socio-Economic Development Plan for Poverty Reduction (DPPR). However, due to the deterioration of the country’s fiscal conditions affected by an increase in expenses of security chiefly in relation to recent pirate attacks and the worldwide economic crisis, and the subsequent aging of road construction, delays in construction work schedules and other factors, the achievement rate of the Third DPPR during 2006-98 turned out to be a mere 68.5%.

The Nukum Road Construction Machinery Workshop, built in 1994 with Japan's Grant Aid Program "Establishment of the Workshop for Road Construction Machinery", has considerably contributed to the improvement of road network nationwide in Republic of Yemen. (The Workshop is involved in the development of some 3,000km-long national road network and some 12,800km-long rural road network.) However, 15 years have elapsed since then: the machineries then purchased have become decrepit, and the operating rate of road construction equipment has been falling considerably. In line with this, the Government of Republic of Yemen has requested the Government of Japan to cooperate concerning the upgrading of some machineries and facilities of the Workshop in order to proceed with the maintenance and development of the road network as planned.

The aims of this Project are to upgrade and enhance the facilities and machineries of the Nukum Road Construction Machinery Workshop in such circumstances, improve the capability of repairing and maintaining construction equipment, turn around the operating rate of the construction equipment, and then encourage the development of the road network of the country.

In passing, the machineries consisted of a total of 66 items in August 2008 when they were initially requested, but the initial request was reconsidered in October 2009 when the field survey was being conducted. Afterwards, GCRB submitted the final request as shown in the following table, which consists of 174 items of repairing equipment and 24 items of road construction machines (60 units).

Table 2-1-1 List of Finally Requested Machineries

Category	Section / region	No. of items
Machinery for Nukum Road Construction Machinery Workshop	Engine section	34
	Fuel pump section	4
	Electric section	1
	Hydraulic section	14
	Machine section	25
	Welding section	2
	Chassis section	33
	Tire section	5
	General machines	56
Road construction equipment	Regions subject to disputes and floods (A)	8 (18 units)
	Other regions (B)	7 (15 units)
	Other regions (c)	9 (27 units)

2-2 OUTLINE DESIGN OF THE PROJECT

In this Project, by understanding the current condition of each machinery which the Nukum Road Construction Machinery Workshop possesses, and in consideration of the technical level of engineers in charge of repairing work, a design will be drawn up concerning the procurement of machineries to be upgraded or enhanced at the Workshop to achieve the targeted operation rate of construction machines.

2-2-1 Design Policy

2-2-1-1 Design Policy concerning Procurement of Machinery

This Grant Aid scheme will be planned in consideration of the request which the Government of Republic of Yemen made and the results of discussions, and in accordance with the following policy, in order to contribute, on one hand, to the implementation of the Third DPPR of the country aiming at the improvement of accessibility to social services and the vitalization of economic activities through expansions of road construction, and, on the other, to upgrading and enhancing of the repairing and maintenance facilities and machineries of the Nukum Road Construction Machinery Workshop, and the smooth operation, maintenance and management of these facilities and machineries.

GCRB owns some 1,000 road construction equipment, of which only 620 equipment (62% of the operating rate) is usable. In this Project, the allocation of repairing and maintenance machinery and the soft component (Technical Assistance) will be planned for the Nukum Road Construction Machinery

Workshop to raise the number of usable road construction equipment to 800 (80% of the operating rate).

2-2-1-2 Policy on Machinery Allocation

Examinations will be made concerning allocation of machinert for each inspection and repairing section in accordance with the following manners, and confirmation will be made if the allocation will result in the improvement of the number of useable construction equipment to 800.

(1) Understanding of the current inspection and repairing capability

Computing and comparing (i) current inspection and repairing capability and (ii) demand of inspections and repairing work. The necessity for enhancing the capability for each section will be confirmed by the state where (i) < (ii).

(2) Understanding of the shortage of the inspection and repairing capability

Of individual stages of the inspection and repairing process, finding out any stages of poor precision, inefficient stages, and any stages which do not exist at the moment but could make the entire process considerably more efficient if they are adopted. At the same time, understanding the capability, degree of damage and service life of the machineries currently owned.

(3) Equipment allocation plan

In consideration of the results of (2) above, examining how to deal with questionable machineries: whether they should be upgraded or repaired, or whether new machine should be added (if this is the case, the specifications and the number of machines should be also determined).

(4) Confirmation of the inspection and repairing capability and the number of useable equipment after the implementation of the Project

Computing (iii) inspection and repairing capability after the implementation of the Project, and confirming that (iii) > (ii). Confirming that this will lead to a gradual decrease in the number of construction equipment which is currently left unused for repair, and that the number of useable construction equipment will exceed 800 in five years' time after the implementation of the Project.

2-2-1-3 Design Policy concerning Machinery Procurement

Since no repairing and maintenance machinery for construction equipment is manufactured in Republic of Yemen, they will be procured either in Japan or third countries. Although some machine tools are manufactured in countries in Asia other than Japan (China, India, Turkey, etc.), their products do not necessarily receive high reputation, according to a hearing survey to local distributors, private repairing factories and GCRB, the executing agency of the Project, due to uneven quality, difficulty in obtaining

spare parts, lack of manuals and various other problems. Thus, machinery will be in principle procured in OECD/DAC member countries.

2-2-1-4 Design Policy concerning Operation, Maintenance and Management

Staff members assigned to the Nukum Road Construction Machinery Workshop basically have high technical capability. Even so, in order to make it possible to effectively operate, maintain and manage some existing machineries and machineries to be newly procured, and enable the Project to demonstrate its effect to the full, technical assistance (soft component) will be provided to the staff members.

2-2-1-5 Basic Policy concerning Facilities

Some items among machineries to be procured (generators, tire changers, etc.) require new facilities (building), but since buildings required are small in size and can be constructed on the technical level normally available in Republic of Yemen, the Yemeni side will be in charge of the procurement of materials and the implementation, while the planning and designing of the facilities (buildings) will be included in this Project.

2-2-2 Basic Plan

2-2-2-1 Examination of Machinery to Be Procured

In accordance with the Design Policy, examinations have been made concerning equipment to be procured. The results of the examinations concerning machineries in each section of the Nukum Road Construction Machinery Workshop are presented as follows. In passing, machinery will be confined to items required by the Nukum Road Construction Machinery Workshop only, thus not including any road construction equipment for construction, maintenance and management of roads.

<Engine Section>

It has to be concluded that the engine section is extremely short of the repairing and inspection capability at the moment. It is considered that it is not just attributable to the shortage of the number of repairing machines, but to the shortage of testers which has a considerable impact on and results in the poor efficiency of the finishing process and the efficiency in the repairing process.

The major repairing machineries in the engine section (chiefly, grinders and cutting machines) are roughly classifiable into, in terms of part of engines, devices for cylinders, those for shafts and rods, and those for valves. In addition, it is necessary to procure engine dynamometers (output of engines) and other testers.

As for the existing repairing machineries, they are considered to be necessary to upgrade parts, but

unnecessary to upgrade the machine itself. On the other hand, in order to attain a considerable improvement in work efficiency, the provision of facilities to automate the grinding work and the work to release/put rings, which are currently conducted manually, and the upgrading of testers, some of which are currently out of order, will be primary issues in this section.

<Fuel Pump Section>

The section was equipped with various testers in 1993, but currently outsources the inspections and repairing of fuel pumps except for some pumps, since most of its own testers are broken and no longer function. In Republic of Yemen, since the number of private repairing factories capable of inspecting and repairing fuel pumps is limited, and thus the inspection and repairing work is in high demand, the outsourcing takes time and becomes a slowdown factor. In such circumstances, it seems that the section fails to secure half of the repairing capability actually required.

A fuel pump makes up the heart of an engine system, and the demand for the inspection and repairing work of fuel pumps is high. Thus, in order to streamline the inspection and repairing work, that is, to inspect and repair all fuel pumps within the Workshop, it is necessary to upgrade fuel injection pump testers and include nozzle testers, both of which can be used for general construction equipment and construction equipment of KOMATSU.

<Electric Section>

The section is currently equipped with various testers and battery chargers. As for the testers, while technical assistance is necessary, it is not necessary to upgrade them since they can satisfy functionally the demand for inspections and repairing in future. The battery chargers, however, are decrepit, and thus two chargers will be newly supplied to respond to a future increase in the demand.

<Hydraulic Section>

The hydraulic testers, assembling/disassembling machines for cylinders, and other devices currently owned by the Workshop work properly and do not need to be replaced by new ones. However, the section has no lapping machines for vales and rocker cams; the grinding work is conducted manually. It seems that this detracts from the work efficiency and that the section fails to secure half of the repairing capability actually required.

In order to streamline the relevant work, it is necessary to newly procure curved valve lapping machine, curved rocker lapping machine for rocker arm, and lapping machine for cam housing.

<Machine Section>

This section is designed to manufacture and process, with machine tools, parts and materials required for the inspection and repairing work at other sections. Because of this, it is difficult to measure the necessary

repairing capability of this section on its own. Even so, while the section is equipped with almost all necessary machines, such as lathes (one each in large, medium and small size), milling machine, electric chainsaw, drilling machines (large and medium-size), and surface plates, most of these devices were procured in the 1980s, and thus are decrepit, have some problems in precision of the finishing work, and cannot deal with larger parts and materials which are more common at the present day. Therefore, these devices fail to have the necessary repairing capability.

In order to improve the work efficiency and attain the necessary repairing capability, it is considered to be necessary to upgrade almost all machine tools, and newly supply brake disk lathes in high demand and grinding machines for drill bitts..

<Welding Section>

Currently, this section, equipped with one welding machine only, shows an extremely low repairing capability, and thus outsources even the repairing work of radiators which frequently require the work. In particular, the outsourced repairing work of large radiators takes time because of the limited number of repairing companies, affecting considerably the operating rate of construction equipment.

In order to improve the work efficiency, it is necessary to procure facilities to repair radiators, automatic welding machines, automatic gas cutting machines and so on, together with the existing welding machine.

<Chassis Section>

This section is designed chiefly to disassemble faulty construction eqipment, assemble those which have been repaired, and to repair underbody of bulldozers, backhoes and other construction equipment with crawlers.

The disassembling and assembling work for construction machines require overhead traveling cranes, machine washers, forklifts for transport, special tools, and so on. While the overhead traveling cranes are operating, the washers are out of order, and special tools are not necessarily sufficient. It is considered, thus, that the section currently secures half or so of the repairing capability actually required.

As for the repairing work for underbody of crawler mounted equipment, the section only has machinery to disassemble and assemble worn caterpillars, idlers and other parts: it is possible to replace such worn parts by new ones, but the section fails to engage in the actual repairing work - welding overlay on worn-away parts of machines for reuse. The section does not have a special hydraulic pump to remove and put master pins and sprockets fitted in the underbody, and thus the disassembling and assembling work for underbody is inefficient. The repairing capability for this work is extremely poor at the moment.

In order to improve the work efficiency and attain the necessary repairing capability in this section, it is necessary, in terms of the disassembling and assembling work, to upgrade the washers, supply special tools, and upgrade the overhead traveling cranes whose service life is over and thus safety cannot be

proved. In terms of the repairing work for underbody of crawler mounted equipment, it is necessary to newly supply track welders, and hydraulic pumps and tools for disassembling and assembling master pins and sprockets, all of which are now mainstream devices.

<Tire Section>

The section has no automatic tire changers: workers in this section release/attach tires from/to wheels manually, and thus the work efficiency is extremely poor. For the higher work efficiency, it is necessary to be newly equipped with 2 tire changers for tires of different diameters.

<General Workshop Equipment>

Examinations were given concerning trailers, forklifts and other machines necessary to carry in and out faulty equipment, and transfer them within the premises of the Workshop, as well as mobile workshops and lubrication trucks for preventative maintenance.

The Workshop currently owns one trailer, but since it often breaks down, the Workshop uses rented trucks. However, the number of low-floor trailers which are suitable to carry construction equipment is limited, and thus there is certain loss time.

On the other hand, the Workshop currently rents cranes necessary to lift down carried-in construction machines from a project of which GCRB is in charge. In addition, the service life of a forklift which the Workshop itself owns is over, and thus its function is not sufficient.

The Workshop owns mobile workshops and lubrication trucks: however, their service lives are over, and they are decrepit, and hardly function.

For the higher work efficiency, it is necessary to newly supply the above-mentioned trailers, cranes and forklifts as transporting machines. Mobile workshops and lubrication trucks make it possible to conduct minor repair on site, prevent unnecessary breakdowns of machines and thus reduce the burden of the Workshop. Thus, it is considered to be necessary to supply new ones, as well as, maintenance and upgrading of the vehicles currently owned.

The equipment to be procured is summarized as follows.

Table 2-2-1 Machinery to Be Procured

Section	No. of items of machinery to be procured	Summary of machinery to be procured
1. Engine Section	29	As for cylinder drilling machines, crankshaft grinders, etc., the existing machines will be repaired and continue to be used. Turning devices for sleeve counter bore, cylinder head and cylinder block pressure testers and other machines, with which the section is not equipped at the moment, will be procured.
2. Fuel Injection Pump Section	4	12-cylinder pump testers (currently, 6-cylinder testers are in possession) and Cummins PT pump testers (for KOMATSU machines) will be newly procured, so as to conduct the maintenance work for pumps of all major construction machines.
3. Electric Section	1	Battery chargers will be procured to replace the current, decrepit ones.
4. Hydraulic Section	13	Gauges and testers, and grinding machines will be procured and used with the existing machines so as to improve the work efficiency.
5. Machine Section	25	Gauges and testers, decrepit large machine tools (lathes, milling machines, etc.) which has problems in their precision, and accessories and tools
6. Welding Section	3	Radiator repair stands with accessories, automatic gas welding machines and cranes (the welding machines will be included in "9. General Workshop Equipment") which the section does not own and thus outsources the relevant work.
7. Chassis Section	32	Automatic welding machines and accessories for underbody of crawler machines which the section does not own; overhead traveling cranes to replace the current ones which may not be safe; and other devices will be procured.
8. Tire Section	6	Automatic tire changers (for large, medium, and small sized vehicles) and accessories, which are not in possession, will be procured.
9. General Wprkshops Equipments Section	64	Trailers, forklifts and other machines to carry in and out faulty machines, and transfer materials and equipment; mobile workshops and lubrication trucks for on-site maintenance and repairing to reduce the burden of the Center; and generators, transformers and other factory facilities to make up for the shortage of electric capacity will be procured.

2-2-2-2 Machinery Procurement Plan

A list of major machinery (worth ¥1 million or more) to be procured is shown below.

Table 2-2-2 List of Major Machinery (1/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
1	Engine Section						
1-1	Eccentric valve seat grinder	Japan	Japan	Capacity: valve seat diameter: 28-60mm	standard model	1	Valve lapping This will ensure the repair of damaged valve sheets, shorten the time required for repair, and thus improve the work efficiency.
1-4	Turning device for sleeve counter bore	Japan	Japan	Applicable diameter: 75-150mm	standard model	1	Equipment to repair engine heads This will be used for the treatment of grooves, and enable accurate handling within short time.
1-13	Cylinder head and cylinder block pressure tester	Japan	France	Workable cylinder head dimensions: L1.0 x W0.4 x H0.3m	standard model	1	Equipment to test engine cylinder head This will enable to detect leakage when compressed due to cracks, etc. of cylinder head, and other causes of breakdown, leading to the better performance of the upgrading work.
2	Fuel Injection Pump Section						
2-1	Diesel fuel injection pump tester	Japan	Great Britain	Pump Application: more than 12 Cylinder Speed range: 100-4,000rp、 Drive motor: not less than 7.5kW	standard model	1	For tests of injection pumps (the tester currently owned is designed for up to 6 cylinders) The tester currently owned is used only for pump tests of up to 6 cylinders because of damage to the measuring system. Furthermore, since the manufacture itself no longer exists, spare parts are unavailable. The equipment to be newly procured can apply for pump tests of large devices (8 or 12 cylinders), one of major items subject to repair, and the maintenance is possible, too. The effective use of functions of the tester will be useful considerably in terms of cost performance and improvement in technology in future.
2-2	Cummins PT pump tester	Japan	Great Britain	Speed range: 500-3,500rm、 Drive motor: not less than 3 kW	standard model	1	For tests of injection pumps (PT pumps) (the tester currently owned is out of order) PT pumps, having compositions different from inline pumps (separately used according to number of cylinders), spray fuel into individual injectors by one shot pumping. The tester can be used for adjustment and inspections of the pumping loads (cc) and pressure (Mpa) of varied types of fuel for varied models (medium- and large-size). If education on inspections and adjustment methods are provided through disassembling and assembling work and operations with the testers, the technical level will be improved.

Table 2-2-2 List of Major Machinery (2/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
2-3	Cummins PT injector test stand	Japan	Great Britain	Motor: not less than 1 kW	standard model	1	For inspections and adjustment of (Cummins) injectors (the test stand currently owned is out of order) An injector tester is a machine, equipped with a device to press "push lot", to gauge the fuel volume sprayed in a time measured so as to compare the defined value (calibration standard value) of each machine. The adoption of the machine will enable to remove the causes of fuel-related troubles.
2-4	Nozzle tester	Japan	Great Britain	Pressure gauge: not less than 0 – 40 Mpa	standard model	1	For inspections and adjustment of injectors (the tester currently owned has reached a limit) The composition of injectors differs from that of injection nozzles; and these two testers are to be used in combination. An injection nozzle tester is a machine to inspect or adjust the pressure required for spraying or the condition of spraying itself by putting the defined pressure (calibration standard pressure) on injections. The adoption of the machine will enable to remove the causes of fuel-related troubles.
4	Hydraulic Section						
4-1	Curved valve lapping machine	Japan	Japan	Application: for valve plate & cylinder block contact surface Max. workable dimensions: not less than 150mm diameter x 150 mm length	standard model	1	For polishing of valve plates and cylinder block of pumps Deterioration of or any damage to oil (dirt, decrease in viscosity, etc.) causes minute blemishes on the surfaces of curved valve plates and arched cylinder blocks which are parts of piston hydraulic pumps and hydraulic motors. The machine to be newly procured will be used to polish and repair such damaged parts so as to make them reusable.
4-2	Curved rocker lapping machine	Japan	Japan	Application: for rocker cam and rocker cam housing contact surface Max. workable dimensions: not less than 200mm diameter x 200 mm length	standard model	1	For polishing of rocker cams of pumps Deterioration of or any damage to oil (dirt, decrease in viscosity, etc.) causes minute blemishes on the surfaces of rocker cams (contour curved valves) which are parts of piston hydraulic pumps and hydraulic motors. The machine to be newly procured will be used to polish and repair such damaged parts so as to make them reusable.
4-3	Lapping machine with accessories	Japan	Japan	Diameter of the lap plate: not less than 600mm diameter Drive motor: not less than 3 kW With accessories	standard model		For polishing of plate housing of pump motors Deterioration of or any damage to oil (dirt, decrease in viscosity, etc.) causes minutes blemishes on the surfaces of lap plate or housing (main body) which are parts comprising hydraulic pumps, and results in a decline in pressure or leakage of oil. The machine to be newly procured will be used to polish and repair such damaged parts so as to make them reusable.

Table 2-2-2 List of Major Machinery (3/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
5	Machine Section						
5-1	Engine lathe	Japan	Japan	Swing over bed: not less than 600 mm Center distance: not less than 3,000 mm	standard model	1	For processing of metal parts An engine lathe is essential for producing any parts which are difficult to obtain or no longer produced by the suppliers. The machine currently owned is decrepit, and in order to improve the efficiency of processing long cylinder parts, it is necessary to adopt a new machine.
5-2	Universal milling machine	Japan	Japan	Max. travel: 710 x 280 x 400mm Table travel: not less than 700 x 250 x 400mm	standard model	1	For processing of metal parts A milling machine is as essential as an engine lathe for producing any parts which are difficult to obtain or no longer produced by the suppliers. Since the machine currently owned is decrepit, the adoption of a new, large machine will improve the efficiency of machine processing.
5-3	Shaping machine with cutting tools	Japan	Japan	Max. stroke: 670mm	standard model	1	For processing of metal parts A shaping machine is as essential as an engine lathe for producing any parts which are difficult to obtain or no longer produced by the suppliers. Since the machine currently owned is decrepit, a new machine will be adopted so as to improve the work efficiency.
5-4	Valve seat and guide boring machine	Japan	Japan	Valve seat diameter: 20-120mm	standard model	1	For releasing and putting rings of the cylinder head The adoption of the machine will enable to release and put rings without damaging the cylinder head by eliminating the currently required time-consuming repairing work (in order to remove the valve sheet, other material has to be first welded to the sheet, and then the sheet has to be hammered. Thus, blemishes and marks of welding remain on the head, and lathing is also required). All this will improve considerably the work efficiency.
5-5	Radial drilling machine with bits & accessories	Japan	Japan	Distance between spindle center and column surface: 1,250-400mm	standard model	1	For processing of metal parts The machine currently owned is decrepit and its electric system breaks down frequently, discontinuing the work process. The adoption of a new machine will improve the work efficiency and ensure the safety.

Table 2-2-2 List of Major Machinery (4/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
5-7	Upright drilling machine with bits & accessories	Japan	Japan	Drilling capacity: not less than 40mm diameter	standard model	2	For processing of metal parts The machine currently owned is decrepit: for example, the drill chuck and sheet have been worn out, and the function of the motor has been lowered. The necessity for adopting of a new machine is fairly high. The adoption of a new machine will improve the work efficiency and ensure the safety.
5-8	Hack sawing machine with accessories & spare blade	Japan	Japan	Cutting capacity: not less than 350mm diameter	standard model	1	For processing of metal parts Currently, the processing of metal of 210mm or larger diameter is outsourced. However, it is costly and time-consuming. The adoption of a new machine will enable the smooth processing and improve the work efficiency.
5-9	Brake disc lathe	Japan	Japan	Capacity: not less than 100 - 300 mm diameter	standard model	2	Lathes for break discs Currently, the engine lathe is applied for repairing and processing of break discs. However, the adoption of a special lathe will improve the work efficiency.
5-21	Rockwell hardness tester	Japan	Japan	Initial load: not less than 98N, Test load: 588.4 / 980.7/1,472 Nm	standard model	1	Tester to gauge and inspect the hardness of iron In Republic of Yemen, steel to be used as material for processing is available. However, it is not certain if the material is appropriately hard enough to produce chisels of buckets and breakers. The tester can gauge the hardness, enabling to select appropriate materials.
5-23	Surface plate, magnetic type, with accessories	Japan	Japan	Type: Magnetic 600 x 450 x 100mm	standard model	1	An apparatus for processing metal parts Machine currently owned: putting a surface plate with a magnet on a operation table of a surface grinder, etc. will make it smoother to grind the surface of a cylinder, gear or other parts.
5-24	Surface plate, magnetic type, with accessories	Japan	Japan	Type: Magnetic 500 x 250mm	standard model	1	
5-25	Electric pipe threader for gas pipe	Japan	Japan	Capacity: not less than 1/4 - 4" gas pipe, Motor: AC 1-phase not less than 500W	standard model	1	For processing of metal parts (equipment currently not owned) The pipe threader will be used to produce and process test pipes (of various sizes) necessary for performance tests of hydraulic pump motors and engines.

Table 2-2-2 List of Major Machinery (5/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
6	Welding Section						
6-1	Radiator repair stand with accessories	Japan	Japan	Applicable radiator size: not less than 1,700 x 1,200mm	standard model	1	For repair of radiators Currently, there are no facilities for repair, and thus repairing work is outsourced. As a result, repairing work costs very much and takes time interfering with the work. The adoption of a new repair stand will make it possible to inspect and repair radiators at their own factories.
7	Chassis Section						
7-7	Brake shoe grinder	Japan	Japan	Capacity: not less than 500kg	standard model	2	Facility for maintenance of automobiles The grinder will be used to process brake shoes so that the shoes evenly contact the surface of the drum brake.
7-9	Master pin remover & installer with cylinder	Japan	Japan	Application: for KOMATSU heavy machine	standard model	4	For upgrading of underbody of bulldozers Master pins and sprockets of bulldozers and other vehicles are pressed into place, so that they cannot be easily removed. These removers will help the releasing and putting master pins and sprockets, as well as other assembling works at factories and on site safely and efficiently.
7-10	Sprocket remover & installer with cylinder	Japan	Japan	Application: for KOMATSU heavy machine	standard model	5	
7-12	Hot water high pressure washer	Japan	Japan	Water discharge: not less than 2,000 liter/hour, Max. pressure: not less than 7MPa, Motor: not less than 5.0kW	standard model	2	Factory facilities for common use Two washers which used to be installed in cleaning room are broken and thus discarded. As part of factory facilities, washers will be installed exclusively for heavy machines and trucks. This will improve the work efficiency and prolong the lifetime of the equipment. It will also make it possible to wash machines both in and outside the factories, contributing to the improvement of safety control.
7-13	Hot water high pressure washer	Japan	Japan	Water discharge: not less than 900 liter/hour, Max. pressure: not less than 7MPa, Motor: not less than 5kW	standard model	2	Factory facilities for common use Installation of washer in maintenance vehicles will enable the cleaning work on site, and improve the work efficiency of diagnoses of breakdown. It will also make it possible to clean the cores of radiators and other devices so that the efficiency of maintenance work will also improve.

Table 2-2-2 List of Major Machinery (6/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
7-14	Hydraulic shop press with electric motor	Japan	Japan	With electric motor, Capacity: not less than 100 ton, Motor: not less than 2 kW	standard model	2	Factory facilities for common use It is difficult to make fine adjustments with a large press (350ton in the machine tool room) when processing small parts; such as adjustment of distorted metal plates, correction of twisted shafts, and releasing and putting bushing, bearing and other small pieces. It could squash small parts. The appropriate choice of machines for appropriate purposes will improve the work efficiency and ensure the safety control.
7-19	Jet parts washer (2 types)	Japan	Japan	Water discharge: not less than 350 ℓ/min, Work table dimensions: not less than 900mm diameter x 600mm height	standard model	1	For cleaning of parts The washers currently owned are used exclusively for the engine section, so they are hardly available for other sections. The adoption of new washers will make it easier to wash parts and clean tools, and also keep the factories as a whole clean.
7-21	Track welder, twin head, with bed and frame	Japan	Japan	Welding current: not less than DC 600A x 2 units, Bed length: Not less than 16m	standard model	1	For upgrading of underbody of bulldozers (welding) As for track links used in bulldozers, the part in contact with idlers and track rollers becomes worn as it is being used, and the track links are eventually slipped out or cut off, resulting in failure in the operation of the bulldozers. Replacement with new ones is costly. This device is used to weld overlay on track links which have been worn out to a certain degree. The welded links can be used as good as new ones, so the cost of renewing underbody equipment will be reduced.
7-23	Roller welder, twin head, with vacuum flux recovery	Japan	Japan	Welding current: not less than DC 600A x 2 units, Applicable max. roller diameter: not less than 1,000mm	standard model	1	For upgrading of underbody of bulldozers (welding) Currently, track rollers (lower roller installed on the lower side of underbody) and idlers (attached on the front of the machine) are manually welded or replaced with new ones, and thus the work and economic efficiencies are poor. However, the adoption of this device will have the similar effect as a track link welder does.
7-27	Flux reclaimer	Japan	Japan	Output capacity: not less than 350 kg/hour	standard model	1	For upgrading of underbody of bulldozers (welding) Flux (powdered) is added to materials to facilitate dissolution. Blocks of welding slag containing flux will be crushed with the machine to be newly adopted, so that mixing agent of the renewed material and new one will be made use of. This will lead to cost reduction.

Table 2-2-2 List of Major Machinery (7/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
7-32	Hoist, 3ton for overhead crane	Japan	Japan	Hoist capacity: not less than 3 ton	standard model	1	For craning and transferring of vehicles, etc. The cranes currently owned are decrepit, and the necessity for adoption of new machines is fairly high.
7-33	Hoist, 5 ton for overhead crane	Japan	Japan	Hoist capacity: not less than 5 ton	standard model	1	
8	Tire Section						
8-1	Heavy duty tire changer	Japan	Japan	Applicable rim diameter: 16 – 50 inch or more, Max. tire dimensions: not less than 2,000mm diameter x 1,000mm width	standard model	1	For replacing tires of heavy machines and general vehicles Currently, tires of vehicles are manually replaced, and thus the work efficiency is poor and various problems arise, such as backaches of the workers involved. The adoption of these new changers will make the releasing and putting of tires easy and fast and also avoid risks of backaches.
8-2	Heavy duty tire changer for truck	Japan	Japan	Applicable rim diameter: 15 – 22 inch or more, Max. tire dimensions: not less than 1,400mm diameter x 500mm width	standard model	1	
8-6	Jib crane	Japan	Japan	Capacity: not less than 1 ton	standard model	1	For craning and transferring of tires The adoption of this crane, together with the tire changers, will improve the work efficiency to change tires.
9	General Workshop Equipment						
9-1	Electrical generator	Japan	Japan	With accessories, Capacity: Not less than 500kVA	standard model	1	Electric power supply The power supply is unstable and the power failure and voltage drop are frequent, thus breaking up the work frequently. The adoption of the generator will solve these problems. Capacity of 500kVA or more will be necessary for the electric needs of the factory as a whole.
9-2	Screw compressor with tank	Japan	Japan	Free air delivery: not less than 2.5M3, Motor: not less than 20kW, Capacity: not less than 300 liter	standard model	1	Facilities for air compression The large compressor currently owned is used only to supply air into the main factory, and there are only small compressors in the supplementary facilities, which cause problems that they have to wait for the large compressor to be available. The adoption of this compressor to the facilities will improve the efficiency of the works to change tires in the tire room and to dry vehicles after cleaning them in the wash facility.

Table 2-2-2 List of Major Machinery (8/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
9-6	Forklift	Japan	Japan	3ton class	standard model	1	For carriage of materials and equipment The forklift currently in operation is small (1.5ton), and thus there is a limit on the carriage volume and weight. The adoption of a large one will solve these problems.
9-7	Mobile workshop with hydraulic crane	Japan	Japan	4x4WD; load tonnage 8t class; aluminum van; with repairing tools and fixings, and crane in front	standard model	3	Mobile workshop Currently, there is only one repairing vehicle in operation, and thus the scope of activities is limited. An increase in the number of mobile workshops will enable minor repairs in more places, and reduce the workload of the Workshop.
9-8	Trailer Truck Head with Low Bed	Sweden	Sweden	Engine Power: 420 HP or more, Max. Loading Capacity: more than 50 ton, with low-floor carriage	standard model	2	For carriage of equipment Currently, there are only two trailer trucks in operation, and thus it is impossible to swiftly deliver heavy machines which are out of order and located various places across the country to the Workshop. An increase in the number of trailer trucks will solve the problem.
9-9	Potable welding machine	Japan	Japan	With accessories, Welding current range: 50 - 500 A or more	standard model	4	Potable welding machines Currently, it is necessary to move articles to the place where a welding machine is installed, and thus the work is inefficient. The adoption of potable welding machines will solve this problem and also enable workers to carry on business trips.
9-10	Lubrication truck	Japan	Japan	6x4WD, aluminum van, with accessories	standard model	1	For supply of lubrication Currently, there is only one lubrication truck in operation, and due to damages and breakdowns of the equipment of the trucks, it is impossible to supply lubrication in a satisfactory manner. In order to lubrications on site swiftly and efficiently, a new vehicle will be adopted.
9-16	Electrical hydraulic pump	Japan	Japan	Max. pressure: not less than 65 Mpa	standard model	2	Equipment for common use The pump will be used together with other tools (pullers, etc.) in order, for example, to pull out gears when disassembling engines; pull out bearings when disassembling hydraulic pumps; and pull out and attach pins and bushing at the time of maintenance of automobiles and other vehicles.
9-40 (1)	Jet parts washer	Japan	Japan	Water discharge: not less than 300 liter/min	standard model	1	For washing parts (to be installed in the hydraulic and medium-sized automobile sections) The washer currently owned is used exclusively for the engine section. The adoption of new washers will shorten the time required to wash parts, make it easier to clean tools and fixings, and also keep the factories as a whole clean.
9-40 (2)	Jet parts washer	Japan	Japan	Water discharge: not less than 500 liter/min		1	

Table 2-2-2 List of Major Machinery (9/9)

Item No.	Name of machinery	Country for pro-curement	Country of origin	Major specifications or composition	Standards of Machinery	Qty.	Intended use Adequacy of standards of machinery
9-41	Engine driven hot & cold water washer	Japan	Japan	Capacity: not less than 600 liter/hour, Pressure: not less than 10MPa	standard model	4	For washing of vehicle bodies Two washers which used to be owned are broken and discarded. The adoption of two washers is the replacement. Since these washers are engine driven, other two washers will be made wide use of for diagnoses of breakdown (oil leakage), maintenance and other activities on sites where no electric power source is available.
9-42	High pressure grease drum pump with hose reel	Japan	Japan	Pump ration: not less than 50:1	standard model	5	Equipment to supply grease Currently, there is one drum pump, but its grease oil pump and other parts are worn and damaged, and thus it cannot be used to supply grease. The adoption of new pumps will restore the function of the mobile supplier, establish the supply system of grease and oil in the factories, and improve the maintenance work.
9-43	Medium pressure oil drum pump with hose reel	Japan	Japan	Pump ration: not less than 15:1	standard model	5	
9-55	Truck Crane	Japan	Japan	Max. Lifting Capacity: 50 ton	standard model	1	For craning and transferring heavy machines, etc. Since the large crane currently in operation does not belong to the Workshop but is purchased by the GCRB (upper organization of the Workshop) for a road project; it cannot be used constantly. A crane is frequently used and thus necessary to load/unload heavy machines and trucks within the factories, and assemble/disassemble large heavy machines which cannot be brought in the factories.
9-56	Dumper	Great Britain	Great Britain	Max. Load: more than 1,200 kg	standard model	1	For carriage of materials, equipment and wastes Currently, only one dumper is in operation and is not enough for the carriage of materials, equipment and wastes. The adoption of a new dumper, together with a forklift, will solve such a problem.
9-63	Transformer (600 kVA)	Greece	Greece	Rated Power: not less than 600 kVA	standard model		Electric power source In order to deal with an increase in power demand due to the adoption of new equipment, the electrical capacitance from the existing power lines will be increased to 600kVA.
9-64	Power Distribution Panel (600kVA)	Yemen	Yemen	600kVA	standard model		To be newly adopted to deal with an increase in the electrical capacitance and the power distribution to equipment to be added.
9-65	Components (Non-fuse breaker)	Japan	Japan	Specifications to meet equipment to be procured	standard model		ditto

2-2-3 Outline Design Drawing

On the following pages, a site plan of the existing repairing factory subject to the procurement of machinery and floor plans of the buildings to be newly built (one for power generators and one for radiators) are shown in Figure 2-2-1. Also, floor plans of buildings to be extended and renovated (one for compressors and one for repairing of tires) are shown in Figure 2-2-2.

Repairing Factory of Nukum Road Construction Machinery Workshop
(including Administration Building)

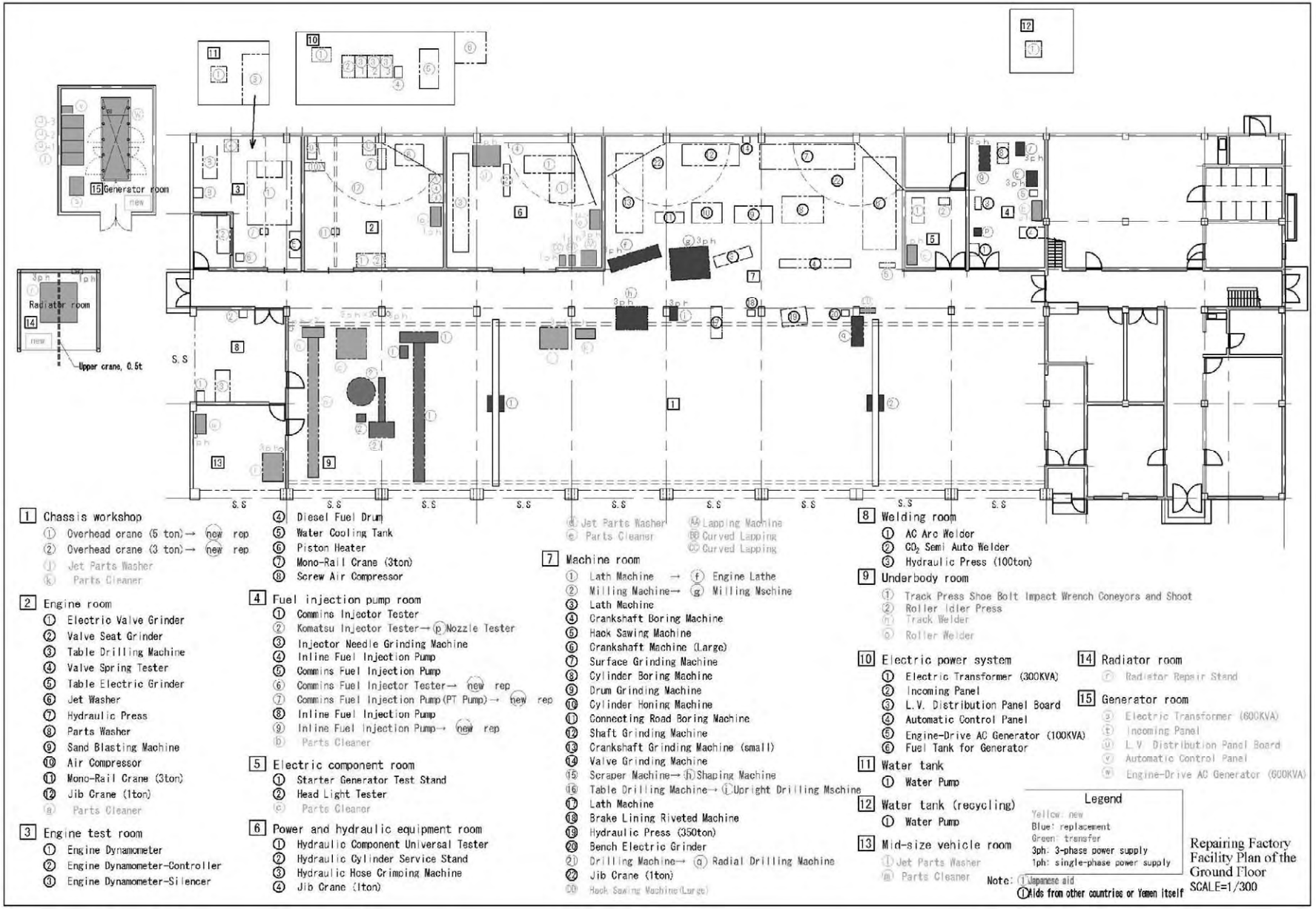


Figure 2-2-1 Facility Plan of New Ground Floor of Repairing Factory (including Buildings for Power Generators and Radiators)

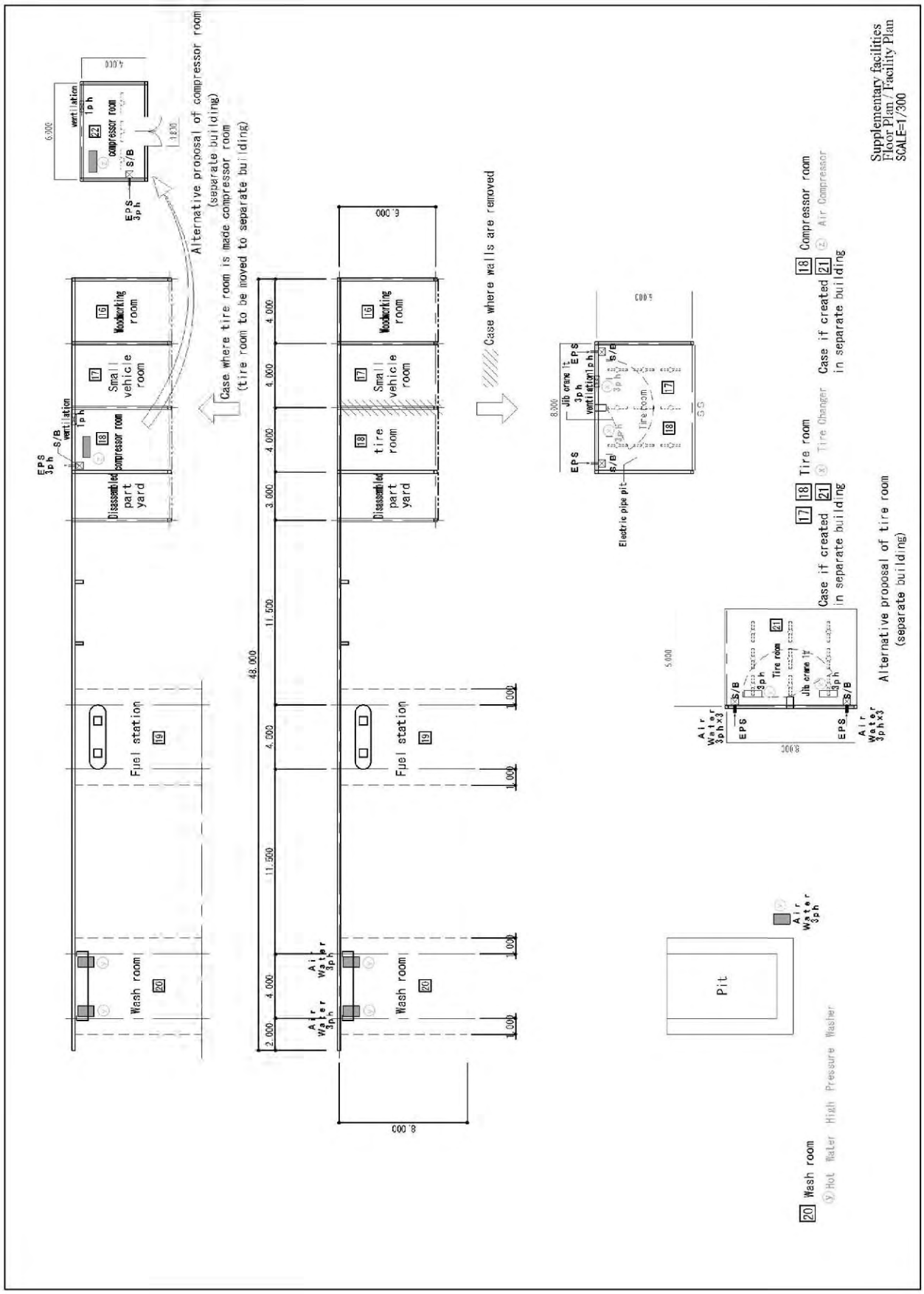


Figure 2-2-2 New Floor Plan and Facility Plan of Supplementary Facilities

2-2-4 Procurement Plan

2-2-4-1 Procurement Policy

(1) Project Implementation Structure

This Project is designed to upgrade and enhance equipment necessary for repair and maintenance of road construction machinery by Japan's Grant Aid to the General Corporation for Road & Bridge (GCRB) affiliated to the Ministry of Public Works & Highways (MPWH). MPWH, the supervising authorities, will conclude an agreement with a Japanese consulting firm, which will implement the consulting work throughout the Project: preparation of implementation design, drawing up of bidding documents, bid evaluation and conclusion of contracts with constructors (agreements concerning procurement of equipment and installation work), procurement control, test operation and delivery by contractors, and implementation of technical assistance (soft component). MPWH itself will conduct a bidding concerning procurement of machinery and installation work with the assistance of the consultant.

The implementation system of this Project is shown in Figure 2-2-3.

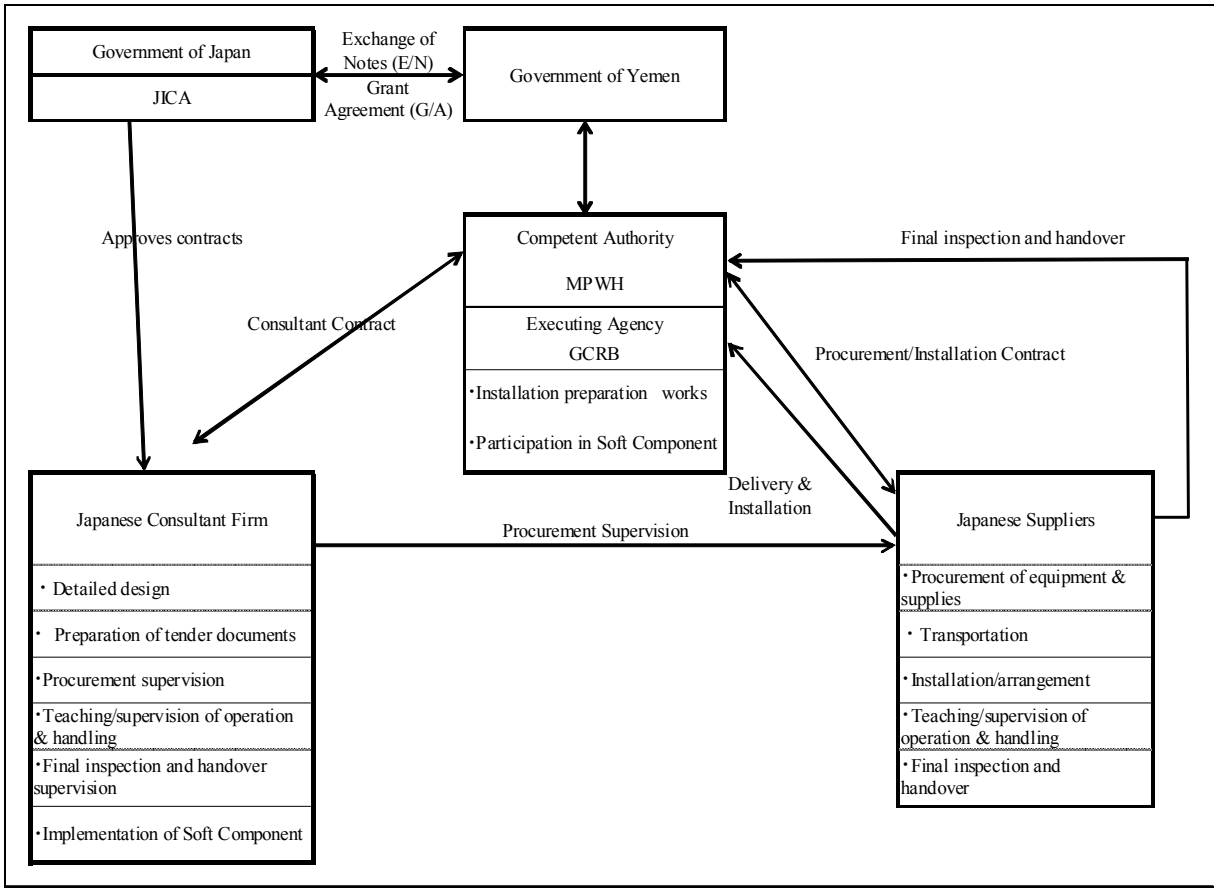


Figure 2-2-3 Relationships of Organizations Engaged in Project Implementation

(2) Consultant

After the signing of E/N, MPWH will immediately conclude a consultant contract with a Japanese consulting firm. The contracted consulting firm will provide engineering services such as, preparation of the implementation design of equipment (including some facilities), drawing up of bidding documents, provision of assistance concerning bidding, procurement supervision, conducting of performance tests, and acceptance inspections, and assume responsibility for a series of stages up to acceptance inspections and completion of delivery of the equipment to be procured. It will also provide technical assistance (soft component) after the delivery.

The contracted consultant will be responsible for providing engineering services with regard to the preparation of detailed design and tender documents, assistance for the tender procedure, and supervision of procurement until the handover of machinery under this Project.

(3) Machinery Supplier

Successful bidders that meet the criteria for quality and specifications in an open competitive tender for pre-qualified suppliers will sign a contract with MPWH with regard to the supply of machinery selected for this Project. The suppliers will deliver, install, conduct start-up operations of, and provide instructions of the operations of the equipment which MPWH has requested.

2-2-4-2 Implementation Conditions

① As stated earlier, all the items of machinery to be procured are products of Japan or Europe, and thus will be transported by sea from Japan or countries of origin in Europe to the Port of Hodeidah in Republic of Yemen. Then the items will be transported by land, installed in the premises of the Nukum Road Construction Machinery Workshop, and delivered to GCRB, the executing agency. Since the Gulf of Aden which ships from Japan to Hodeidah Port need to pass is currently under threat of attacks from pirates, the procurement firms will be required to examine possible measures in advance with carriers and take certain actions to minimize the possibility of problems occurring.

② In this Project, the procurement firms will be in charge of inland transportation and installation of equipment. However, the Yemeni side will be required to make prior arrangements concerning tax exemptions so as to prevent any delay in schedules, and also make sure to establish a system enabling swift customs clearing procedure.

③ Since this Project is the first grant aid program for MPWH and GCRB since fiscal 1992 when the program, “Establishment of the Workshop for Road Construction Machinery”, was put into practice, it is necessary to proceed with the Project while giving them a full explanation of the procedures, as well as the scheme of the grant aid programs of Japan, at each implementing stage.

2-2-4-3 Scope of Works

The scopes of work to be borne by the Japanese and the Yemeni side concerning machinery procurement and installation work are shown in Table 2-2-3.

Table 2-2-3 Obligations of the Japanese and Yemeni Governments

Contents of work		Responsible side		Remarks
		Japan	Yemen	
Procurement, delivery and installation of equipment	Procurement of equipment to enhance functions of Nukum Road Construction Machinery Workshop	○		
	Marine transportation, Landing procedures	○		Landing port: Hodeidah
	Customs clearance and tax exemption and		○	
	Inland transportation and discharge in Republic of Yemen	○		Hodeidah → Nukum Road Construction Machinery Workshop
	Installation work for stationary equipment	○		
	Adjustment, test operations and assistance to start-up operations of equipment	○		
Additional facilities	Removal of old equipment and facilities to be replaced by new ones, and transferring of equipment currently owned		○	
	Construction of new buildings (power generator room, repairing room for radiators, compressor room and repairing room for tires)		○	Including foundation work
	Electric wiring and pipe arrangement for compressed air		○	

2-2-4-4 Consultant Supervision

(1) Principle

The consulting firm will, in accordance with the framework of the grant aid programs of Japanese Government and the relevant consultant contract, as well as in consideration of the purposes of the Outline Design, organize a Project implementation team which will be consistently in charge of the implementation design and the procurement supervision work, so as to fulfill this Project without delay until the completion of the work.

(2) Plan for Procurement Supervision

1) Procurement supervision work

- The consulting firm will, after the conclusion of a consultant contract with the Government of Republic of Yemen, conduct a field survey, have discussions with the executing agency of this Project, and draw an implementation design. It will also prepare detailed design of machinery,

specifications, and various other bidding documents in Japan, and obtain the approval of MPWH, the client.

- The consulting firm will notify the bidding, distribute bidding documents, receive relevant documents from bidders, assess the documents from the bidders, and provide advice concerning the conclusion of the machinery procurement and installation contracts between MPWH and Japanese firms.
- After the conclusion of a contract between MPWH and the successful bidder, the consulting firm will, in Japan, check up production drawings of machinery submitted by the firm receiving the order that is the successful bidder, conduct factory inspections of processed materials and machines, and conduct pre-shipping inspections.
- At the times of delivery, installation and assistance of start-up operation of machinery in the Nukum Road Construction Machinery Workshop, Japanese supervisory staff in charge of local procurement and staff members of the consulting firm will be stationed on a full-time basis.
- The consulting firm will monitor the progress of the installation and other works carried out by the procurement firms, and give guidance to and supervise it.
- The consulting firm will issue necessary certificate and other documents.
- The consulting firm will dispatch their experts after the completion of the assistance to the start-up operations carried out by the procurement firms, and provide the technical assistance (soft component) to the executing agency.
- The consulting firm will conduct various other necessary works, such as contacts and submission of reports to MPWH, the Japanese Embassy, and JICA Office.

2) Personnel Plan of Consulting Firm

① Chief consultant

- Overall management of consulting work
- Work related to contracts and discussions with the related organizations in Japan
- Reviewing of machinery specifications
- Approval of bidding documents
- Notification of bidding, distribution of documents, and attendance at bidding
- Evaluation of bidders

② Machinery planner (1)

- Discussions and confirmation concerning detailed specifications
- Reviewing of machinery specifications
- Drawing up and approval of bidding documents
- Notification of bidding, distribution of documents, and attendance at bidding

③ Machinery planner (2)

- Drawing up of bidding documents

④ Procurement supervisor

- On-site pre-meetings
- Inspections and delivery

⑤ Full-time on-site procurement supervisor
- Supervision of carrying-in, installation, start-up operations, and other activities concerning machinery
- Inspections and preparation for delivery

⑥ General management
- Drawing up of implementation plan of soft component and teaching materials for management education
- Implementation of management education, reporting the result of soft component

⑦ Technical instructor (1)
- In charge of soft component related to engines and drawing up of instruction manuals
- Implementation of training concerning the operation and management of engine-related devices

⑧ Technical instructor (2)
- In charge of soft component related to hydraulic machine and drawing up of instruction manuals
- Implementation of training concerning the operation and management of hydraulic devices

⑨ Technical instructor (3)
- In charge of soft component related to underbody devices and electric section and drawing up of instruction manuals
- Implementation of training concerning the operation and management of devices related to underbody and electrical machinery

2-2-4-5 Quality Control Plan

In order to verify if the machinery to be procured is meeting the quality standards and specifications set forth in the contract, the following inspections will be conducted at each stage of the procurement work:

- Confirmation of contents of machinery order sheets issued by the supplier
- Factory inspection and inspection before delivery in the manufacturing plant
- Pre-shipping inspections (crosschecking with packing lists) by a third-party inspecting organization
- Inspection at handover of machinery (checking of shortage of quantities, abnormality of appearance, contents of accessories, operation check, etc.)

2-2-4-6 Procurement Plan

(1) Country of Origin

1) Repairing Machinery

Since any items of repairing machineries to be procured are not manufactured in Republic of Yemen, they will be procured either in Japan or third countries. Major engines and items shown below which

are related to fuel injection pumps are chiefly products of the U.K. and France, so the countries of origin will be set as those in Europe.

- Cylinder head and cylinder block pressure tester
- Diesel fuel injection pump tester
- Cummins PT pump tester
- Cummins PT injector test stand
- Nozzle tester

2) Vehicle-type Construction Machineries to Back up Repairing Factories

The reasons for procurement of vehicle-type construction machineries, and countries in which they are procured are as follows:

- Mobile workshop with hydraulic crane, Lubrication truck: to be procured in Japan in consideration of ensuring of the quality and reliable delivery time in relation to vehicle fitting
- Forklift, Truck Crane: to be procured in Japan in consideration of the high popularity (i.e., easiness to procure spare parts) in Republic of Yemen, and ensuring of the quality
- Trailer Truck Head with Low Bed: to be procured in Europe in consideration of the high popularity (i.e., easiness to procure spare parts) in Republic of Yemen
- Dumper: to be procured in Europe in consideration of the limited choices of manufacturers

(2) Delivery Route

In this Project, all pieces of machinery for repairing road construction equipment will be brought in from abroad. There are two possible ways of marine transportation to avoid risks of pirate attacks off the coast of Somalia: (i) land in UAE or elsewhere and transport by land; or (ii) ship directly to a port in Republic of Yemen. This Project will adopt course (ii) which is considered to minimize the risks and to be the most efficient as a result of survey. In passing, the marine transportation from Europe and Japan to Republic of Yemen will take 0.5 month and 1.0 month, respectively.

1) Landing Port

Candidate landing ports include the Port of Aden (Gulf of Aden), the Port of Hodeidah (Red Sea), and the Port of Mukalla (Arabian Sea): in consideration of the matters to examine as shown in the following Table 2-2-4, the Port of Hodeidah has been chosen (for reference, see Figure 2-2-4: Landing Port and Transportation Route). In passing, the Port of Hodeidah was used also for the project for the Establishment of the Workshop for Road Construction Machinery.

Table 2-2-4 Chart for Examination of Landing Port

Matters subject to examination		Port of Aden	Port of Hodeidah	Port of Mukalla
Port facilities	Container wharf	Available	Available	Not available
	Facilities for landing	Available	Available	Not available
Regular service	General cargo ships	Available	Available	Not available
	Container ships	Available	Available	Not available
Transportation routes after landing	Road conditions	Good (mountainous road)	Good (mountainous road)	Fair (partially in poor conditions)
	Major pass cities	Taiz and Ibb	Bajil	Marib
	Transportation distance	443km	226km	777km
Evaluation		Good	Excellent	Fair

2) Land Transportation Route

The land transportation route selected in accordance with the foregoing table includes mountainous roads with single traffic lane except for in the urban areas. Since it includes quite a few steep places and hairpin turns, trailers and other vehicles are obliged to run slowly. Even so, a number of trailers take this route on a routine basis, and thus there is no particular problem. Land transportation will take two to three days after landing.

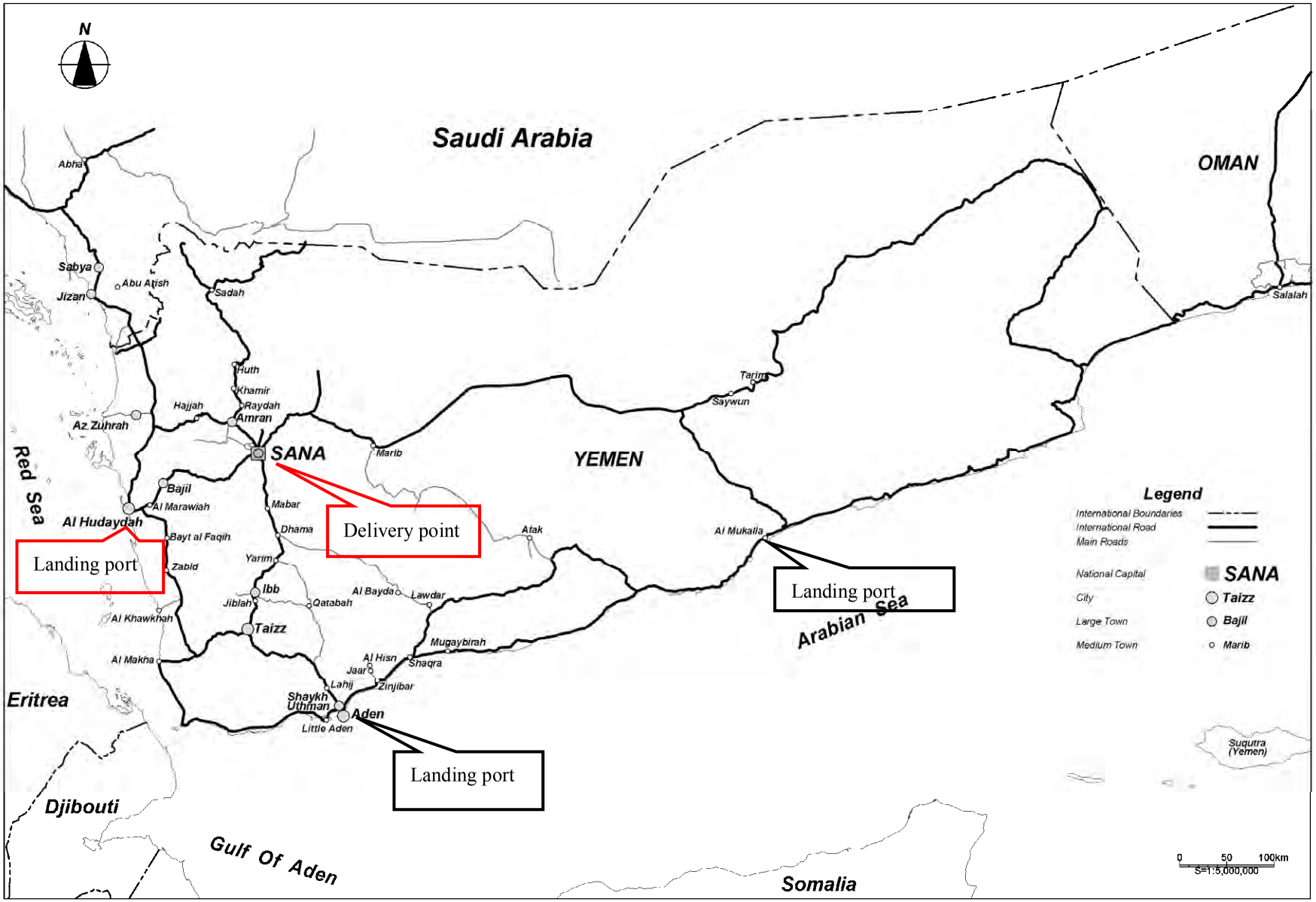


Figure 2-2-4 Landing Port and Transportation Route

3) Custom Procedures

Where the tax exemption measures are concerned, MPWH first submits an application for tax exemption to the Minister of Finance, which will in turn send a letter of approval to the procurement firms. The procurement firms will present the letter to the custom clearance at the port. In normal circumstances, it takes one months to receive a letter of approval after submitting an application. At the landing port, it usually takes three to four days to wait offshore for the port to be clear and to proceed with the customs clearance.

4) Transportation Methods

Methods of transporting each machinery will be as shown below in Table 2-2-5.

Table 2-2-5 Transportation Methods, by Machine Type

Machinery	Type of packing	Marine transportation	Land transportation
Small machinery	Dry container	Container ship	Trailer
Large machinery	Open-top container or bare	Container ship or general cargo ship	Trailer or freight car
Vehicles	Bare	General cargo ship	On its own
Special vehicles	Bare	General cargo ship	Trailer

Note: Vehicles means mobile workshop with hydraulic crane, lubrication truck, truck crane and trailers.

2-2-4-7 Operational Guidance Plan

In time for the delivery of machinery technical instructors dispatched from the procurement firms will conduct test operations and adjustment of the equipment; confirm if the machinery works properly; and give instructions to representative persons of the responsible team of the Nukum Road Construction Machinery Workshop concerning the operations and the methods of routine checkups. Quite a few pieces of machinery will be supplied under this Project and multiple suppliers are expected. Therefore, a plan should be drawn up to minimize the number of staff members including personnel in charge of instruction, installation works and assistance to the start-up operations by assigning the instructing works for more than one kind of machinery to each engineer. The personnel plan of the installation work, adjustment and test operations, and assistance to the start-up operations is shown in Table 2-2-6.

Table 2-2-6 Personnel Plan of Installation Work, Adjustment and Test Operations, and Assistance to Start-up Operations

Person in charge	No. of persons	Period	Scope of work
Technical instructor from manufacturer (A)	1	2.0 months	Supervision of installation work, adjustment and test operation of machinery, and assistance to start-up operations
Technical instructor from manufacturer (B)	1	2.0 months	Supervision of installation work, adjustment and test operation of machinery, and assistance to start-up operations
Local workers (skilled)	2	16 days	Loading, unloading and unpacking of equipment, and installation work
Local workers (general workers)	6	16 days	Loading, unloading and unpacking of machinery, and installation work
Local operators of heavy machines	2	16 days	Operation of forklift and crane to be used for installation work

In passing, the assistance given by manufacturers will be limited for the start-up operations. For more effective use, the technical assistance via soft component will be provided as described below.

2-2-4-8 Soft Component (Technical Assistance) Plan

As stated in Section 2-2-1-4, for effective and efficient use of the machineries to be procured under this Project, the technical assistance via soft component will be provided in accordance with the plan describe below.

(1) Backgrounds

The field survey has found that it is necessary to enhance the technical aspects of the Nukum Road Construction Machinery Workshop, the executing agency in Republic of Yemen, in reference to the operation, maintenance and management of machinery. Therefore, the soft component will be put into practice.

(2) Objectives

In order to ensure the effect which the implementation of this Project could produce, the soft component concerning the operation, maintenance and management of machinery will be put into practice.

(3) Activities of Soft Component

The following activities will be implemented.

- Drawing up and usage of manuals
- Selection of educational machinery (selection of calibration materials, parts and machine tools to be used for practical training)
- Training on disassembling of engines, operation of performance tests, and records management

- Training on operation of injection pump testers, and records management
- Training on operation of performance tests of hydraulic pumps, motors and transmissions, and records management
- Training on operation of testers for alternators and starters, and records management
- Training on operation of new machinery (such as rollers and track welders), and records management
- Training on methods of drawing up repairing and maintenance plans (management training)

(4) Schedules and Personnel

For efficient technology transfer in a short period of time, it is necessary to allocate personnel who are familiar with the functions, structures and operation methods of machinery to be procured, and have experiences of providing instructions on machineries. It is also necessary to organize a total plan starting with drawing up of various plans and manuals and concluding with on-site practical training along with implementation and supervision of the flow in accordance with such a systematic plan. In consideration of these conditions, it seems difficult to secure certain outputs with local resources only. Thus, the soft component will be planned as a direct assistance by a Japanese consultant who is familiar with soft component and has work experiences.

Table 2-2-7 and Table 2-2-8 show the personnel plan of the soft component of this Project and the implementation schedule respectively.

Table 2-2-7 Personnel Plan for Soft Component

Person in charge	Rate	Months	Work	Contents of Work
General supervisor	2	0.25	In Japan	Drawing up of the implementation plan and instruction manuals concerning management education
		0.33	On site	Implementation of on-site practical training concerning management and report concerning the outcomes of technical assistance to the organizations concerned
Technical instructor (1)	3	0.50	In Japan	Engine section: Drawing up of instruction manuals concerning injection pumps and engine dynamos
		1.00	On site	Implementation of on-site practical training concerning operation and management of devices related to engines
Technical instructor (2)	4	0.50	In Japan	Hydraulic section: Drawing up of instruction manuals concerning hydraulic devices (pumps and motor transmissions)
		1.00	On site	Implementation of on-site practical training concerning operation and management of hydraulic devices
Technical instructor (3)	4	0.50	In Japan	Underbody equipment and electricity-related equipment: Drawing up of instruction manuals concerning new underbody equipment and electricity-related equipment including electrical equipment
		1.00	On site	Implementation of on-site practical training concerning underbody equipment and electricity-related equipment including electrical equipment
Local assistant (1)	Local staff	1.00	On site	Assistance to Japanese technical instructors (1)
Local assistant (2)	Local staff	1.00	On site	Assistance to Japanese technical instructors(2)
Local assistant (3)	Local staff	1.00	On site	Assistance to Japanese technical instructors(3)

Table 2-2-8 Implementation Schedule of Soft Component (1/3)

Education plan concerning inline fuel pump tester, PT, pump injector test stand, and engine dynamometers

No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning inline-type fuel injection pumps**																															
1	Structures and functions of inline injection pumps, and operation and maintenance method of testers		AM	Lecture: pumps and testers																												
2	Disassembly and partial inspections: delivery valves, tappets, plungers, etc.		PM	AM	Practical training: disassembly																											
3	Assembly: bearings, camshafts, tappets, plungers, etc.				AM	AM	Practical training: assembly																									
4	Use of testers: usage of special tools and adjustment methods (OJT)								AM	AM	AM	Practical training: adjustment methods (OJT)					Calibration practical training: OJT						Calibration practical training: OJT							Review		
5	Days for confirmation tests and review											AM	Tests															Tests		Review		
*	**Education concerning Cummins PT pumps**																															
1	Structures and functions of PT pumps, names of PT pumps, meanings of signs on plates, etc.															AM	AM	Lecture: pumps and testers														
2	Disassembly and partial inspection of PT pumps currently in use (OJT)															PM	PM	Practical training: disassembly (OJT)														
3	Assembly of PT pumps currently in use (OJT)																	Practical training: assembly (OJT)														
4	Use of testers: usage of special tools and adjustment methods (OJT)																	Practical training: OJT					Calibration practical training: OJT									
5	Days for confirmation tests and review																											Tests		Review		
*	**Education concerning usage of Cummins injector test stand**																															
1	Usage of testers and methods of data description (OJT)								PM	PM	PM	Lecture: test methods				Calibration practical training: OJT							Calibration practical training: OJT							Review		
*	**Education concerning methods of assembly and disassembly of engines and usage of**																															
1	Assembly and disassembly of engines (OJT): usage of special tools and measuring methods			PM	PM	PM	Practical training: usage of special tools																									
2	Usage of engine testers: calculation of horsepower and fuel consumption, etc.											Usage of testers				Practical training of engine hp testers							Practical training of engine hp testers									
3	Methods of data description concerning tests of engine horse power (OJT)										Methods of data description					Practical training of engine hp testers							Practical training of engine hp testers							Review		
4	Days for confirmation tests and review																											Tests		Review		

Remarks	1. Education concerning inline fuel pump	2. Education concerning PT pump testers	3. Education concerning injector test stands	4. Education concerning engine dynamos
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; Engine model; pump type (e.g.) PE-A type; and serial No. (e.g.) 12345, will be clarified in advance. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; PT pump names; and plate signs, will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; injector No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; Engine model; serial No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.

Table 2-2-8 Implementation Schedule of Soft Component (2/3)

Education plan concerning assembly and disassembly, and test methods of hydraulic devices (pump motors and transmissions)

No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning hydraulic pumps and motors**																															
1	Hydraulic pumps: structures and functions of gear pumps, piston pumps, clinoaxis pumps, and skew plate	Lecture: pumps and testers																												Review		
2	Disassembly and partial inspections of hydraulic pumps currently in use (OJT)	Practical training: disassembly & assembly																														
3	Hydraulic testers: structures, functions, operation, and maintenance methods				P M	P M	Practical training: testers																									
4	Use of testers: usage of special tools and adjustment methods (OJT)								A M	A M	A M	Practical training: OJT on calibration methods																		Review		
5	Days for confirmation tests and review												Tests																			
*	**Education concerning transmissions and control valves**																															
1	Assembly and disassembly of missions (OJT): usage of special tools and measuring methods								Lecture: functions of missions																					Review		
2	Disassembly and assembly of missions currently in use (OJT)											P M	P M	Practical training: OJT on disassembly																		
3	Use of testers: bench tests and adjusting methods (OJT)															Practical training: OJT on bench tests																
4	Days for confirmation tests and review																	Practical training: OJT					Practical training: OJT on bench tests									
5	Usage of testers and methods of data description (OJT)																				Practical training: OJT on bench tests						Tests		Review		
*	**General knowledge of hydraulic pressure**																															
1	General knowledge: principles of hydraulic pressure, hydraulic pressure and flows, viscosity, phenomenon unique to hydraulic pressure, outlines of hydraulic						As needed					As needed									As needed						Tests			Review		
*	**Methods of creating equipment for tests**																															
1	Flanges, joints, pipes, and others						As needed							As needed							As needed						As needed					
*	**Rapping machines**																															
1	Usage of rapping machines						As needed							As needed							As needed						As needed					
2	Maintenance and inspections of rapping machines						As needed							As needed							As needed						As needed					

Remarks	1. Education concerning hydraulic pump testers	2. Education concerning hydraulic motor	3. Education concerning transmissions	4. Education concerning control valves
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; Engine model; pump type and No., will be clarified. * Serial No. (e.g.) 12345 etc. will be clarified in advance. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; Engine model, will be clarified. * Motor type and No. will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; transmissions No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; Engine model will be clarified. * Serila No. will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.

Table 2-2-8 Implementation Schedule of Soft Component (3/3)

Education Plan concerning electric devices, track welders, roller welders, and management (upgrading and repairing)

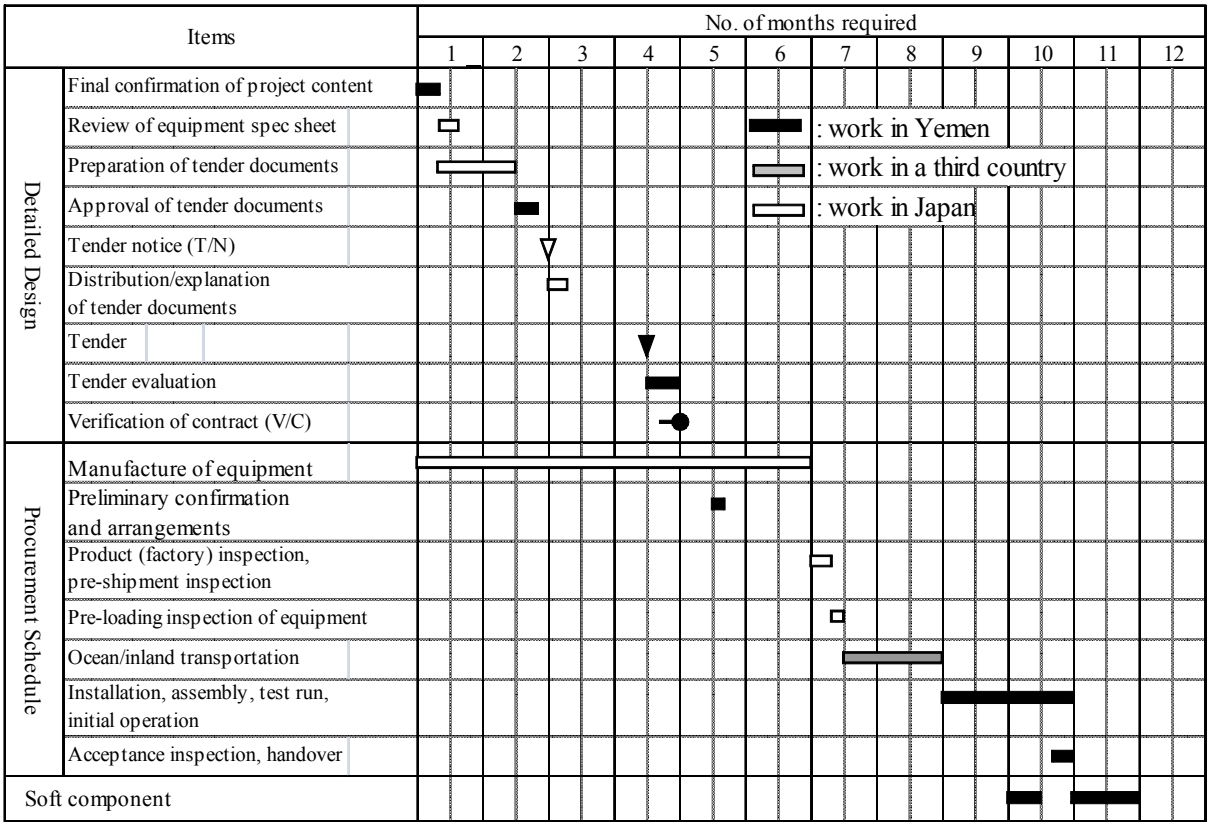
No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning electricity: voltage, electric current, resistance, usage of test bench, batteries,**																															
1	Voltage, electric current, resistance, usage of testers, batteries, electric circuits, and electric devices (basics of alternators and starters)		A M		Lecture: basics of electricity																											
2	Disassembly and partial inspections: disassembly of alternators and starters, inspection methods, and		P M	P M	Practical training: disassembly and inspections (OJT)																											
3	Test methods with test bench: alternators (restraint test, no-load test, output test, notices at the time of tests, and methods of data description)				A M	A M			Practical training: assembly and bench tests (OJT)							Bench tests practical training : OJT			Review			Bench tests practical training : OJT				Review			Review		
4	Test methods with test bench: starters (adjusting voltage, no-load test, output test, notices at the time of tests, and methods of data description)				P M	P M			P M	P M	P M	Practical training: calibration methods (OJT)				Bench tests practical training : OJT				Review			Bench tests practical training : OJT				Review			Review		
5	Days for confirmation tests and review												Tests														P M	Tests			Review	
*	**Usage of track welders and roller welders**																															
1	Structures, functions and operation methods: the order of weld overlay on the surface to run the roller, and the order of weld overlay on roller flanges									A M	A M	A M	A M			A M	A M						A M	A M	A M	A M						
										Lecture		Practical				Practical training: OJT							Lecture		Practical							
2	Method of weld overlay: notices after weld overlay for roller welder, twin head, with vacuum flux recovery, and notices for the order of weld overlay for track welder									A M	A M	A M	A M			P M	P M						A M	A M	A M	A M	P M					
										Lecture		Practical				Practical training: OJT							Lecture		Practical		Tests			Review		
3	Special characteristics and notice for storage, prevention of breakdown, and maintenance of welding wires and flux									Lecture		Practical						As needed														
*	**Repairing and upgrading plan (management education)**																													Review		
1	Maintenance, inspection and management of factory facilities: management table for upgrading of equipment																				Lecture: method of drawing up of equipment lists											
2	Upgrading plan: methods of entry, intermediate, completion, shipping and other inspections																				Lecture: method of drawing up of equipment lists									Review		
3	Upgrading plan: methods of drawing up and filling upgrading records and inspection records																				Lecture: method of drawing up of equipment lists											
4	Safety education																						Lecture: notices of safety									
5	Education addressed to foremen, ranks of middle management, fresh recruits and workers on various																						Lecture: problems and proceeding									
6	Inventory check: arrival and shipping of partial goods																						Lecture: inventory							Review		
7	Confirmation tests																											Tests		Review		

Remarks	1. Bench tests of alternators	2. Starter bench tests	3. Education concerning weld overlay for track welder and roller welder	4. Management education
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; engine model; alternator serial No., will be clarified. * The numbers of alternator parts will be clarified. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; starter serial No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; serial No. will be clarified. * The numbers of track link and roller parts will be clarified. * Special tools and spare parts will be prepared. * Tables of standard values for weld overlay will be prepared.	* Preparation of teaching materials * Preparation of tables of maintenance, inspections, etc. * Preparation of materials for safety management * Preparation of inventory check lists, etc.

2-2-4-9 Implementation Schedule

The planned implementation schedule of detailed design, bidding, procurement and its supervision, and operations related to soft component in this Project is shown in Table 2-2-9.

Table 2-2-9 Implementation Schedule



2-3 OBLIGATIONS OF RECIPIENT COUNTRY

If this Project is implemented through Japan's Grant Aid, the Government of Republic of Yemen will be responsible for the following matters:

(1) Concerning facilities and equipment

- Construction of a building for power generators (8m × 6m = 48m^2)
- Construction of a building for repairing of radiators (5m × 5m = 25m^2)
- Renovation of the compressor room
- Extension and renovation of the building for repairing of tires
- Handling (removal and moving) of the existing facilities
- Electric wiring
- Pipe arrangement for compressed air

(2) Others

- To bear commissions to the Japanese foreign exchange bank for its banking services, based upon the Banking Arrangement (B/A).
- Measures concerning exemption from customs and import duty, permissions and authorization, and customs clearance procedures arising from imports of the equipment to be procured under this Project
- To provide facilities for Japanese personnel in entering and staying in Republic of Yemen and visiting relevant government agencies to perform their duties under the Project.
- To exempt Japanese nationals and corporations engaged in the Project from custom duties and other internal taxes.
- Making appropriate and effective use of, and maintaining and managing machinery to be procured
- To bear all expenses, other than those covered by the Japan's Grant Aid, necessary for the Project.
- Securing of the safety of all persons involved in this Project

2-4 PROJECT OPERATION PLAN

2-4-1 Maintenance and Management System of Equipment

The machineries to be procured under this Program will be made use of, maintained and managed at the repairing department of the Nukum Road Construction Machinery Workshop. The workers of the department include both young inexperienced workers and skilled ones of mid- and higher level. Since they are engaged in repairing and maintenance of construction equipment on a routine basis, their technical level concerning repairing and maintenance is high. However, their technical level concerning, for example, fine adjustments of machineries, and performance tests and other inspections requiring fairly high skills is not necessarily sufficient enough. Thus, the technical assistance concerning the methods of operations, routine maintenance and management of the machinery to be procured, as well as those for the existing equipment, will be provided through the soft component. It is considered that, after the completion of the soft component, the personnel at the repairing department will be able to make more effective use of the machineries to be procured under this Project, and conduct more efficiently the maintenance, inspection and repairing work for construction equipment and vehicles.

2-4-2 Personnel Plan

The Nukum Road Construction Machinery Workshop can be organizationally divided into four major divisions: general affairs, finance, production planning and production (repairing). The Workshop has currently a total of 159 staff members: the number of staff members in each job category is shown in Table 2-4-1. In passing, the staff members are classified into regular staff, contract staff, and day workers.

Table 2-4-1 Number of Staff Members, by Job Type

Job type	No. of staff	Assignments
Production department	78	Repair, regular inspections and management of all the construction equipment belonging to GCRB
Management department	47	Finance, general affairs, personnel affairs, procurement, management of parts and documents, and secretarial work
Service department	23	Facility management, fuel management, procurement of parts, transportation related to repairing factories
Security department	11	Security guard of repairing factories and other facilities

Source: GCRB

One of the major departments in the production division is the repairing department, which consists of the following 12 sections and 1 unit as shown in Table 2-4-2.

Table 2-4-2 Number and Age of Staff Members, by Section

	Section name	No. of staff	Age range (average)		Section name	No. of staff	Age range (average)
1	Engine section	9	21～45 (34)	8	Heavy machine section	9	25～43 (32)
2	Fuel injection section	4	42～53 (48)	9	Mid-size vehicle section	12	25～51 (36)
3	Electric section	8	21～35 (28)	10	Small vehicle section	5	25～41 (30)
4	Power and hydraulic section	8	29～55 (41)	11	Tire section	2	31, 49 (40)
5	Machine section	5	27～63 (47)	12	Asphalt plant section	2	37, 39 (38)
6	Welding section	3	40～57 (48)	13	Woodworking room	1	34 (34)
7	Chassis section (underbody)	2	29, 59 (44)		Total	70	21～63 (37)

The repairing machinery will be upgraded and enhanced via the implementation of this Project. However, not so many new models will be procured, which are track welder, track roller, and roller welder of twin head with vacuum flux recovery only. Thus, it is considered that the current personnel in the relevant sections will be able to handle them. Three mobile workshops, two trailers, and one lubrication truck will be procured, and each machine will require operators. Even so, a certain number of workers will become redundant due to the streamlining of the work within the Workshop as a result of the procurement of tire changer, dumpers and forklifts, and thus can be allocated to the operations of these machines.

2-5 PROJECT COST ESTIMATION

2-5-1 Project Cost Estimation

(1) Cost borne by the Government of Japan

The project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note for the project.

(2) Cost borne by the Government of Republic of Yemen: YR4.9 million (approx. ¥2.2 million)

In implementing this Project, the cost to be borne by the Yemeni side will be YR4.9 million as shown in Table 2-5-1. In practice, GCRB, the executing agency of the Project, will bear the cost. It will be financed as part of expenses of the service department, which accounts for 0.041% of the total expenses of the department (YR11,814 million). Thus, GCRB has the financial ability sufficient enough to make the payment.

Table 2-5-1 Cost borne by the Government of the Republic of Yemen (Unit: 1000YR)

Item	Cost
①Construction of the building for power generators (48m^2)	1,600
② Construction of the building for repairing of radiators (25m^2)	840
③Construction of the building for repairing of tires (24m^2)	800
④Electric wiring (300m)	540
⑤Pipe arrangement for compressed air (120m)	330
⑦Bank charge	790
合　　計	4,900

(3) Parameters of Cost Estimation

① Time of cost estimate: November 2009

② Exchange rate:1 US$ = 95.07 yen
:1 YR = 0.448 yen

③ Procurement period: Implementing design and procurement of equipment will be as shown in implementing schedules.

④ Others: This plan will be put into execution in accordance with the grant aid system of the Government of Japan.

2-5-2 Operation and Maintenance Cost

The machineries to be procured in this Project will be made use of, maintained, and managed at the repairing department of the Nukum Road Construction Machinery Workshop. As stated earlier, the staff members of the repairing department has high technical standards concerning repairing and maintenance works, since they have all graduated from high school, vocational training school or have higher educational background, and are engaged in repairing and maintenance work of construction machines on a routine basis.

Actual maintenance and management works for the machineries to be procured in this Project include overhauls, precision adjustment and the supply of fuels and lubrications to run the equipment. As shown in Table 2-5-2, the total maintenance and management cost is estimated at YR20.66 million per year, which will be financed as the service expenses of GCRB, accounting for 0.17% of the total expenses of the service department (YR11,814 million). Thus, GCRB has the financial ability sufficient enough to make the payment.

Table 2-5-2 Annual Maintenance and Management Cost

No.	Equipment	Spec. (kw)	Equipment price (thousand yen)	Qty.	Rate of maintenance (%)	Service life (yr.)	Standard tenure of use by Nukum Workshop (yr.)	Annual maintenance ratio (%)	Maintenance and repair cost/year unit (ten thousand yen)	Maintenance and repair cost/year (ten thousand yen)	Fuel consumption/ year unit (ten thousand yen)	Fuel consumption/ year (ten thousand yen)
1	Stationary repairing equipment (1 set)	-	160 000,0	1	30%	15,0	22,5	1,3%	213,3	213,3	-----	-----
2	Power generator	450,0	23 000,0	1	45%	9,5	14,3	3,2%	72,6	72,6	118,9	118,9
3	Compressor	22,0	3 000,0	1	30%	12,0	18,0	1,7%	5,0	5,0	-----	-----
4	Forklift (3ton)	-	4 800,0	1	35%	9,5	14,3	2,5%	11,8	11,8	2,3	2,3
5	Mobile workshop (WD4x4, with crane)		20 000,0	2	45%	11,0	16,5	2,7%	54,5	109,1	10,8	21,5
6	Trailer truck (420HP)	-	24 000,0	2	35%	11,0	16,5	2,1%	50,9	101,8	47,2	94,5
7	Potable welding machine (engine driven)	-	2 400,0	4	35%	11,0	16,5	2,1%	5,1	20,4	0,6	2,3
8	Lubrication truck (WD6x4)	-	18 400,0	1	45%	11,0	16,5	2,7%	50,2	50,2	6,5	6,5
9	Truck Crane (50ton)	-	42 600,0	1	30%	11,0	16,5	1,8%	77,5	77,5	17,9	17,9
	Total									661,7		263,9

Conditions in the cost estimate;

Based on the "Depreciation Calculation Table for Construction Equipment, Etc." (Japan Construction Mechanization Association)

Equipment price: body price or estimated price (CIF)

Standard tenure of use at Nukum Workshop (yr.) = service life x 1.5

Annual maintenance ratio = maintenance ratio÷standard tenure of use at Nukum Workshop

Annual maintenance cost = equipment price x annual maintenance ratio

1YR＝0.448yen

Fuel consumption is based on the "Depreciation Calculation Table for Construction Equipment, Etc." (Japan Construction Mechanization Association)

Cost of diesel fuel: 60YR/Litter＝26.88yen/Litter

Cost of oil: 1% of fuel cost

Annual maintenance cost	20,66 mln.YR	9,26 mln.yen

2-6 OTHER RELEVANT ISSUES

The number of pieces of the machinery to be procured in this Project totals 177, and even if the number of wheeled equipment is deducted, a great number of pieces will be carried from the landing port to the Nukum Road Construction Machinery Workshop. For this land transportation, it is considered that 20 or more 20Ft containers will be necessary. Also, for the smooth installation work, it is necessary to transport them in accordance with a carefully drawn transportation plan which takes into account the order of pieces of machinery for installation.

In this Project, the Yemeni side will be responsible for the construction of new buildings or the expansion and renovation of the existing ones for power generators and the repairing work for radiators; electric wiring; and some other work. Since these tasks only require the technical skills commonly available in the country, there will be no particular problem. However, it is necessary to complete the construction work – except for the roof of the building for power generators – prior to the bringing-in of the machinery. Therefore, it is important to monitor the progress of the construction work as needed.

Where the transportation of the machineries of this Project is concerned, in consideration of various circumstances, a plan is being drawn up that the transport vessel will pass through the Somali pirate area which is currently posing a great threat to some 20,000 commercial ships each year plying between the Mediterranean and the Indian Ocean, and will make port at the Port of Hodeidah in Republic of Yemen to discharge the machinery. For the actual implementation, it may be necessary to consider a safer and more reliable transportation pathway in consideration of various factors arising in the future.

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3-1 PROJECT EFFECT

Table 3-1-1 Project Effect

Present conditions and problems	Solutions to be offered by the Project	Direct effect and degree of impact	Indirect effect and degree of impact
In Nukum Road Construction Machinery Workshop, machinery for repairing and maintenance of construction equipment has become decrepit and its capacity is now under 50% of the demand. Because of this, operating rate of construction equipment hovers at around 62%, lowering achievement rate of road construction plan, and thus hindering physical and personnel intercommunications.	Upgrading and enhancement of repairing machinery for road construction equipment	(i) The upgrading and enhancement of repairing and maintenance machinery for construction equipment will increase the number of active construction equipment which are owned by GCRB from current 620 to 800. (ii) Implementation of soft component will improve capability of operating, maintaining and managing machineries	(i) Development of road network will improve access to social services, contributing to better life environments of the people. (ii) Development of road network will contribute to the vitalization of regional economies.

3-2 RECOMMENDATIONS

3-2-1 Tasks of and Recommendations to the Government of Republic of Yemen

The Japanese side and GCRB have agreed on and confirmed the following matters in the minutes of discussions and technical notes.

(1) Appropriate implementation of maintenance of construction machinery after completion of the Project

The implementation of this Project will result in the upgrading and enhancing of repairing and maintenance machineries, and thus in strengthening the technical capability for the operations, maintenance and management of machineries. In order to translate these achievements into the direct effects (i) shown above, it is necessary to conduct the greater number of inspections and repairs than the number required as a result of use of construction equipment owned by GCRB, thus reduce the number

of equipment on the waiting list for repair and increase the operating rate of the equipment.
As for injection pumps, for example, although 500 pumps require inspections and repairs each year, the current capacity of inspection and repairing work is 250 per year. It is necessary to increase the capacity up to 600 pumps per year after the completion of the Project for smoother inspection and repairing work.

(2) Record of progress in road construction work

For the purpose of confirming the arising of the foregoing indirect effects (i) and (ii), GCRB will record the progress in the road construction work. Matters to be recorded include project names, scope of the projects, grades of roads subject to the projects, and photographs of construction sites.

3-2-2 Technical Cooperation and Collaboration with Other Donors

This Project will upgrade and enhance the repairing machineries for construction equipment, and the soft component to be implemented subsequently will provide instructions concerning the operations of various pieces of machinery, practical training of repairing and maintenance, management of records on repairing and maintenance works, and methods of drawing up repairing and maintenance plans so that the Nukum Road Construction Machinery Workshop can make effective use of the machineries to be procured under this Project, as well as the existing machineries. It is considered that all this will enable the Workshop to demonstrate its full functions as a repairing and maintenance factory for construction equipment. However, in order to make effective and maximum use of road construction equipment and to contribute greatly to development of the road network, it is essential, not just to restore the function of the Workshop, to enhance the management capability of GCRB, which owns the equipment and is responsible for actual road work, to draw up accurate implementation plans of each fiscal year including machinery development and allocation plans.

Appendices

1. Member List of the Study Team
2. Survey Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions (M/D)
5. Soft Component (Technical Assistance) Plan
6. References / List of Obtained Data

Appendix 1. Member List of the Study Team

1. Member List of the Study Team

At the time of field survey

	Name	Job title	Affiliation
1	Mr. Shuntaro KAWAHARA	Leader	Senior Adviser to the Director General, Economic Infrastructure Department, JICA
2	Ms. Eri KIMURA	Project Coordinator	Staff, Urban and Regional Development Division I, Economic Infrastructure Department, JICA
3	Mr. Hiroshi HONDA	Chief Consultant/ Road Planner	Katahira & Engineers International
4	Mr. Tomohiko NAKAMURA	Equipment Planner I/ Operation & Maintenance Planner	Katahira & Engineers International
5	Mr. Makoto SUGIYAMA	Equipment Planner II/ Installation Planner	Katahira & Engineers International
6	Mr. Kazuo MIZUKOSHI	Procurement Planner/ Cost Estimator I	Katahira & Engineers International
7	Mr. Nassim JEBARI	Interpreter	Katahira & Engineers International

At the time of Briefing Survey for Outline Design

	Name	Job title	Affiliation
1	Mr. Shuntaro KAWAHARA	Leader	Senior Adviser to the Director General, Economic Infrastructure Department, JICA
2	Mr. Hiroshi HONDA	Chief Consultant/ Road Planner	Katahira & Engineers International
3	Mr. Tomohiko NAKAMURA	Equipment Planner I/ Operation & Maintenance Planner	Katahira & Engineers International
4	Mr. Nassim JEBARI	Interpreter	Katahira & Engineers International

Appendix 2. Survey Schedule

2. Survey Schedule

At the time of field survey

	Date		JICA		Consultant				
			Mr. Kawahara Leader	Ms. Kimura Project Coordinator	Mr. Honda Chief Consultant/Road Planner	Mr. Nakamura Equipment Planner I/Maintenance Planner	Mr. Sugiyama Equipment Planner II/Installation	Mr. Mizukoshi Procurement Planner/Cost Estimator I	Mr. Jebari Interpreter
1	Oct. 5	Mon			**HND/2030-KIX/2145(EK6251 by JAL) KIX/2315-(EK317)**				
2	6	Tue			**-DXB/0445(EK317), DXB/0705-SAH/0850(EK961)** Meeting w/JICA Yemen Office Courtesy calls on MPWH and GCRB				
3	7	Wed			Site Visit (Nukum Workshop), Meeting w/GCRB (Receipt of final request form), Meeting w/JICA Yemen Office				
4	8	Thu			Site Visit (Nukum Workshop), and hearing survey				
5	9	Fri			Document Arrangement				
6	10	Sat			Site Visit (Nukum Workshop), hearing survey, hearing survey to MPWH				
7	11	Sun			Site Visit (Nukum Workshop),hearing survey				
8	12	Mon			Move to Hodeidah (by air), and site visit				
9	13	Tue			Hearing surveys at Hodeidah branches of MPWH and GCRB, Hodeidah workshop, and move to Sana'a (by land)				
10	14	Wed			Visits and hearing surveys to private repairing factories in Sana'a				
11	15	Thu			Visit to vocational training schools in Dhahban, and visits and hearing surveys to private repairing factories in Sana'a city				
12	16	Fri			Document Arrangement, Preparation of Report				
13	17	Sat			Receipt of answers from MPWH, and examination of the answers		Workshop survey		
14	18	Sun			Receipt of answers from GCRB, and examination of the answers		Survey on equipment in workshop		
15	19	Mon			Submission of additional questionnaires, consultation with Workshop, drawing up of reports, and market surveys				
16	20	Tue			Consultation with GCRB, hearing survey to Road Maintenance Fund (RMF), and survey on equipment in workshop				
17	21	Wed			Workshop survey and submission of questionnaires to MPWH				
18	22	Thu			Market survey				
19	23	Fri	**HND/2030-KIX/2145(EK6251 by JAL) KIX/2315-(EK317)**		Review/Preparation of Report				
20	24	Sat	**DXB/0445(EK317)** **DXB/0705-SAH/0850(EK961)**						
			Courtesy calls on Japanese Embassy, JICA Yemen Office, MPWH and MPIC						
21	25	Sun	Courtesy calls on GCRB, visits to workshop, and commencement of drawing up of M/D						
22	26	Mon	Discussion w/MPWH, GCRB						
23	27	Tue	Discussion w/MPWH, GCRB, Preparation of M/D (draft)				Market survey		Preparation of M/D
24	28	Wed	Finalization & Signing of M/D at JICA Office, Report to EOJ				Survey at Workshop		
25	29	Thu	**SAH/1005-DXB/1340(EK962)**		Preparation of TN		Market survey		
26	30	Fri	**DXB/0310-KIX/1720(EK316), KIX/1915-HND/2025(EK6252 by JAL)**		Market survey, preparation of TN				
27	31	Sat			Signing of TN w/GCRB		Move to Dubai		
28	Nov. 1	Sun			Report to JICA Yemen Office		Move to Dubai		
29	2	Mon			**SAH/1005-DXB/1340(EK962)**		Market survey at Dubai		**SAH-DXB(EK962)**
30	3	Tue			**DXB/0310-KIX/1720(EK316), KIX/1915-HND/2025(EK6252 by JAL)**				

HND: Haneda (Tokyo)
KIX: Kansai (Osaka)
DXB: Dubai
SAH: Sana'a
EOJ: Embassy of Japan

At the time of Briefing Survey for Outline Design

	Date		JICA	Consultant		
			Mr. Kawahara Leader	Mr. Honda Chief Consultant/Road Planner	Mr. Nakamura Equipment Planner I/Maintenance Planner	Mr. Jebari Interpreter
1	Jan. 16	Sat	**ISLAMABAD/04:10 - DOHA/06:15(QR399)** **DOHA/13:00- SAH/15:45(QR454)**	**HND/19:50-KIX/21:10(JL185)** **KIX/23:20-**		
2	17	Sun		**DXB/5:15(EK317)** **DXB/7:15-SAH/9:00(EK961)**		
			11:00 Briefing and consultation with MPWH and GCRB in Road Construction Machinery Workshop at Nukum 15:00 Courtesy call on and briefing to EOJ 16:30 Courtesy call on JICA Yemen Office			
3	18	Mon	09:30 Briefing and consultation with MPWH and GCRB in Road Construction Machinery Workshop at Nukum			
4	19	Tue	09:00 Consultation of M/D with MPWH and GCRB in Road Construction Machinery Workshop at Nukum Preparation of M/D (final)			
5	20	Wed	07:30 Signing of M/D 11:00 Report to MoPIC 15:00 Repor to EOJ 16:30 Reort to JICA Yemen Office			
				SAH/19:00- DXB/22:50(IY862)		
6	21	Thu	**SANNA/16:45- DOHA/19:10(QR455)**	**DXB/03:30- KIX/17:20(EK316)** **KIX/18:45- HND/19:55(JL188)**	Survey on situations affecting procurement	
7	22	Fri	**DOHA/00:50- KIX/16:20(QR820)** **KIX/18:15- HND/19:25(JL186)**		Survey on situations affecting procurement	
8	23	Sat			Survey on situations affecting procurement Consultation about and signing of T/N	
9	24	Sun			**SAH/10:15-DXB/13:45(EK962)**	
10	25	Mon			**DXB/03:30-KIX/17:20(EK316)** **KIX/18:45-HND/19:55(JL188)**	

HND: Haneda (Tokyo)
KIX: Kansai (Osaka)
DXB: Dubai
SAH: Sana'a
EOJ: Embassy of Japan

Appendix 3. List of Parties Concerned in the Recipient Country

3. List of Parties Concerned in the Recipient Country

At the time of field survey

<Yemeni Side>

Ministry of Public Works and Highways (MPWH)

Omar A. Al-Kurshomi	Minister
Abdul Wahab Yahya Al-Hakem	Deputy Minister of Road Sector
Nabil Al Wazir	IT General Director
Ismail M.Alkebsi	Director of Public Relation
Anis Nasser Assamawi	Chairman of Road Maintenance Fund
Aiman Motahar Al-Eryani	Vice Chairman of Road Maintenance Fund

Ministry of Planning & International Cooperation (MPIC)

Hisham Sharaf Abdalla	Vice Minister
Omar A. Abdulghani	Director General of the Bilateral Cooperation with the States of Asia & Australia
Mohammed M. Shamsaddin	Local Coordinator for Japan International Cooperation Agency (JICA)

General Corporation for Road and Bridge (GCRB)

Ahmed Hamed al-Haisamy	GCRB Vice Chairman
Gassim Mohammadou	Technical Office Adviser
Abdellah Rasea	General Director of Project Department
Ahmad Q. Al-Houthy	Director General of Statistics, Planning & International Cooperation
Taha Al-mahbashi	Director General of Road Maintenance

GCRB Mechanic & Stores

Abubakr Humam	Director General for Mechanic & Stores
Abdulkarim Assharafi	Mechanic General Manager
Hassan Maqoula	Vice Director General for Mechanic & Stores

GCRB Central Workshop

Abdulkarim Al-Obahi	Workshop General Director
Mohammed Amine Ghazali	Technical Director
Moqbil Amir Dirham	Training Manager
Mohsin Hassan Jaafar	Training Manager
Ahmed Hassan Alkebsi	Finance Manager
Lotf Hamoud Taifi	Estimation Manager
Khalid Hamoud Karshami	Administration Manager
Adil Mohammed Harazi	Secretary Manager
Mohammed Abdrazaq Tahir	Cost Section Manager

<Japanese Side>

Republic of Yemen Embassy of Japan

Masakazu Toshikage	Ambassador
Hiroki Haruta	Second Secretary

JICA Yemen Office

Takeshi Komori	Resident Representative
Megumi Shuto	Project Formulation Adviser
Yoshie Hama	Project Formulation Adviser

At the time of Briefing Survey for Outline Design

<Yemeni Side>

Ministry of Public Works and Highways (MPWH)

Omar A. Al-Kurshomi	Minister
Nabil Al Wazir	IT General Director
Ismail M.Alkebsi	Director of Public Relation
Davy KnoKry(AbuSamir)	Attached to the Minister Office

Ministry of Planning & International Cooperation (MPIC)

Hisham Sharaf Abdalla	Vice Minister
Mohammed M. Shamsaddin	Local Coordinator for Japan International Cooperation Agency (JICA)

General Corporation for Road and Bridge (GCRB)

Ahmed Hamed al-Haisamy	GCRB Vice Chairman
Nabil Al-Haify	Executive Manager in GCRB
Gassim Mohammadou	Technical Office Adviser
Ahmad Q. Al-Houthy	Director General of Statistics, Planning & International Cooperation
Taha Al-mahbashi	Director General of Road Maintenance

GCRB Mechanic & Stores

Abubakr Humam	Director General for Mechanic & Stores
Abdulkarim Assharafi	Mechanic General Manager

GCRB Central Workshop

Abdulkarim Al-Obahi	Workshop General Director
Mohammed Amine Ghazali	Technical Director
Moqbil Amir Dirham	Training Manager
Adil Mohammed Harazi	Secretary Manager

<Japanese Side>

Republic of Yemen Embassy of Japan

Masakazu Toshikage	Ambassador
Matahiro Yamaguchi	Counsellor, Deputy Head of Mission
Kohei Akiyama	First Secretary
Hiroki Haruta	Se cond Secretary

JICA Yemen Office

Takeshi Komori	Ambassador
Megumi Shuto	Project Formulation Adviser

Appendix 4. Minutes of Discussions (M/D)

4. Minutes of Discussions (M/D)

At the time of field survey

Minutes of Discussions
on the Preparatory Survey
on the Project for Upgrading and Revitalization
of Road Construction Machinery Workshop at Nukum
in Republic of Yemen

In response to a request from the Government of Republic of Yemen (hereinafter referred to as "the Yemen"), the Government of Japan decided to conduct a Preparatory Survey on the Project for Upgrading and Revitalization of Road Construction Machinery Workshop at Nukum (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Yemen the Preparatory Survey Team (hereinafter referred to as "the Team"), which is managed by Mr. Shuntaro Kawahara, Senior Adviser to the Director General, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from October 6, 2009 to November 2, 2009 .

The Team held discussions with the officials concerned of the Government of Republic of Yemen and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare a Draft Report of the Preparatory Survey.

Sana'a, October 28, 2009

Mr. Shuntaro Kawahara
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Eng. Omar A. Al-Kurshomi
Minister
of Public Works and Highways
Chairman of Board of Directors
General Corporation for Roads and Bridges
Republic of Yemen

Witness

Eng. Hisham Sharaf Abdalla
Vice Minister
of Planning & International Cooperation
Republic of Yemen

ATTACHMENT

1. Purposes of the Survey

The purposes of the First Site Survey are described as follows;

(1) To reconfirm the contents of the requested Project,

(2) To make the site survey and collect the necessary data and information to know details of the situation of road sector and road construction machinery in Yemen, and

(3) To explain the Japan's Grant Aid scheme to the Yemeni side.

2. Objective of the Project

Both sides confirmed that the objective of the Project is to improve the capacity for the maintenance and development of the road network by raising operational rate of the construction machinery of "General Corporation for Roads and Bridges" (hereinafter 'GCRB') through upgrading and revitalization of the equipment and facilities in the Nukum Road Construction Machinery Workshop (hereinafter 'the Workshop').

3. Project site

The site of the Project is located in Sana'a, as shown in Annex-1.

4. Responsible and Implementing Agency

4-1. The responsible ministry for the Project is "Ministry of Public Works and Highways" (hereinafter 'MPWH'), and its organization chart is shown in Annex-2.

4-2. The implementing agency for the Project is GCRB, and its organization chart is shown in Annex-3.

4-3. The Yemeni side explained to the Team that there is no plan for the implementing agency to be privatized in near future, and that the equipment procured by the Japanese Grant will be used properly and exclusively for maintaining road construction machinery.

5. Items requested by the Government of Yemen

5-1. Both sides reconfirmed that the items described as follow were requested by the Yemeni side.

5-2. The list of construction machines used in the Workshop is shown in Annex-4-1. The list of construction machines used in road project site is shown in Annex4-2.

5-3. With regard to Annex-4-2, since Yemen government and GCRB suffer from flood in Hadaramout and Al Mahara Governorates, conflict in Sa'ada and Amran, and fiscal difficulties

caused by economic depression, GCRB additionally requested equipment listed in Annex-4-2. The Team mentioned that Japanese and Yemeni side should give priority on rehabilitation and upgrading of the Workshop, and Yemeni side understood.

6. Japan's Grant Aid Scheme

6-1. The Yemen side understood the Japan's Grant Aid scheme explained based on Annex-5 by the Team.

6-2. The Yemen side will take the necessary measures, as described in Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6-3. With regard to ensuring custom clearance and tax exemption, the Ministry of Planning and International Cooperation (MoPIC) is responsible for taking necessary measures, whose procedures is initiated by MPWH's letter sent to the vice minister of MoPIC to ask the Customs for prompt permission.

7. Schedule of the Survey

7-1. The consultants will continue to do further studies in the Yemen until November 2, 2009.

7-2. JICA will prepare a draft report of the Preparatory Survey in English and dispatch a mission in order to explain its contents around the end of January, 2010.

8. Other relevant issues

8-1. Both sides confirmed the legal status of the GCRB shown as Annex-7.

8-2.The Yemeni side explained to the Team that the status of GCRB is a Yemeni Government Agency for implementing construction and maintenance of roads. MPWH can issue direct order to GCRB to implement road projects based on the Article (5), Annex-7. GCRB is an indispensable administrative organization to maintain the road network in Yemen since private constriction companies have been little interested in road maintenance works and are limited capabilities.

8-3.The Yemeni side strongly requested for implementing the training program for the machinery of the Workshop. The Team mentioned the necessity of upgrading the management system as well as the training for the machinery maintenance.

8-4.With regard to the disposal of machineries and equipment finished life time period provided by the Japan's Grant Aid, the Government of Republic of Yemen has to convey the Note Verbal requesting consent to the Embassy of Japan in Yemen. Yemeni side understood that they can dispose only when the machines have operated more than life time period, which is commonly understood 10-15 years.

Annex-1: The Project Site

Annex-2: Ministry of Public Works and Highways Organization Chart

Annex-3: General Corporation for Roads and Bridges Organization Chart

Annex-4-1: The list of equipment used in the Workshop

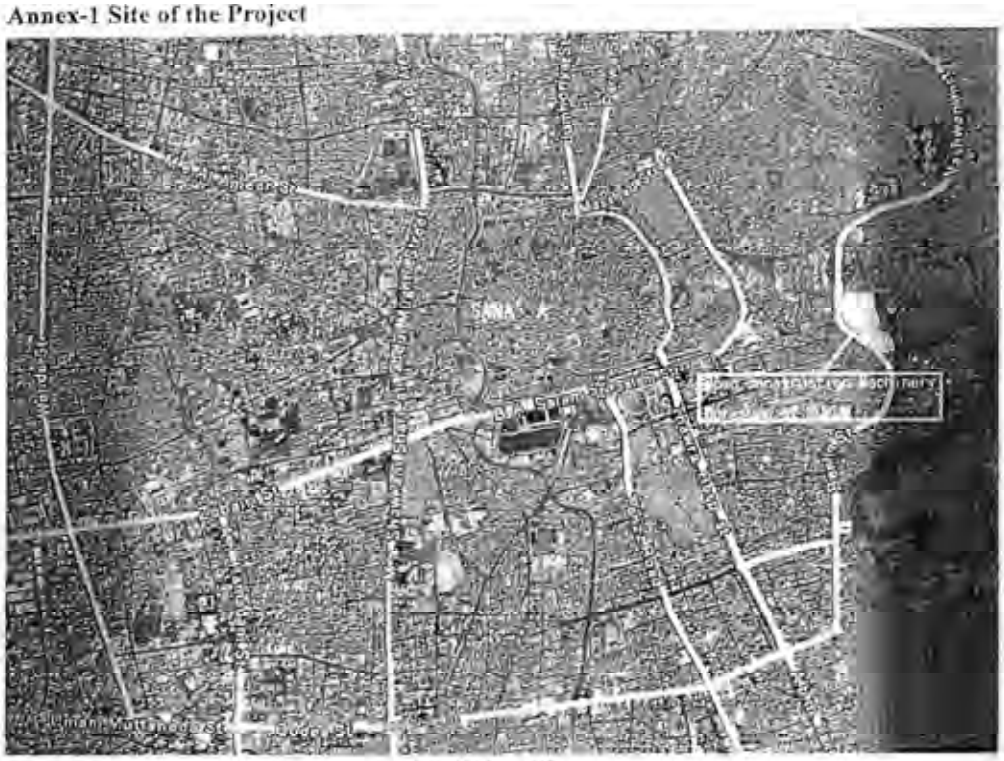
Annex-4-2: The list of equipment used for the road maintenance projects and emergency works

Annex-5: The Grant Aid Scheme

Annex-6: Major Undertakings to be taken by Each Government

Annex-7: The Year 1998 Pertaining to the Establishment of the General Corporation for Roads and Bridges (Republic Decree No.269 for the year 2000)

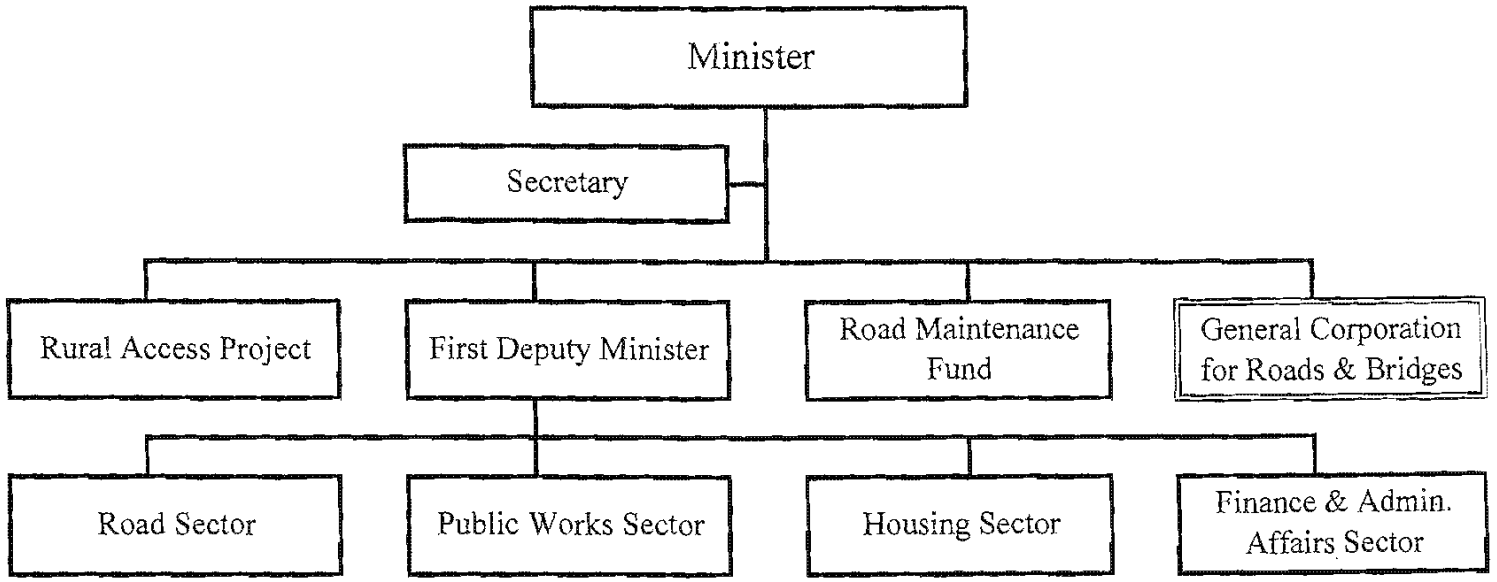
Annex-1 Site of the Project



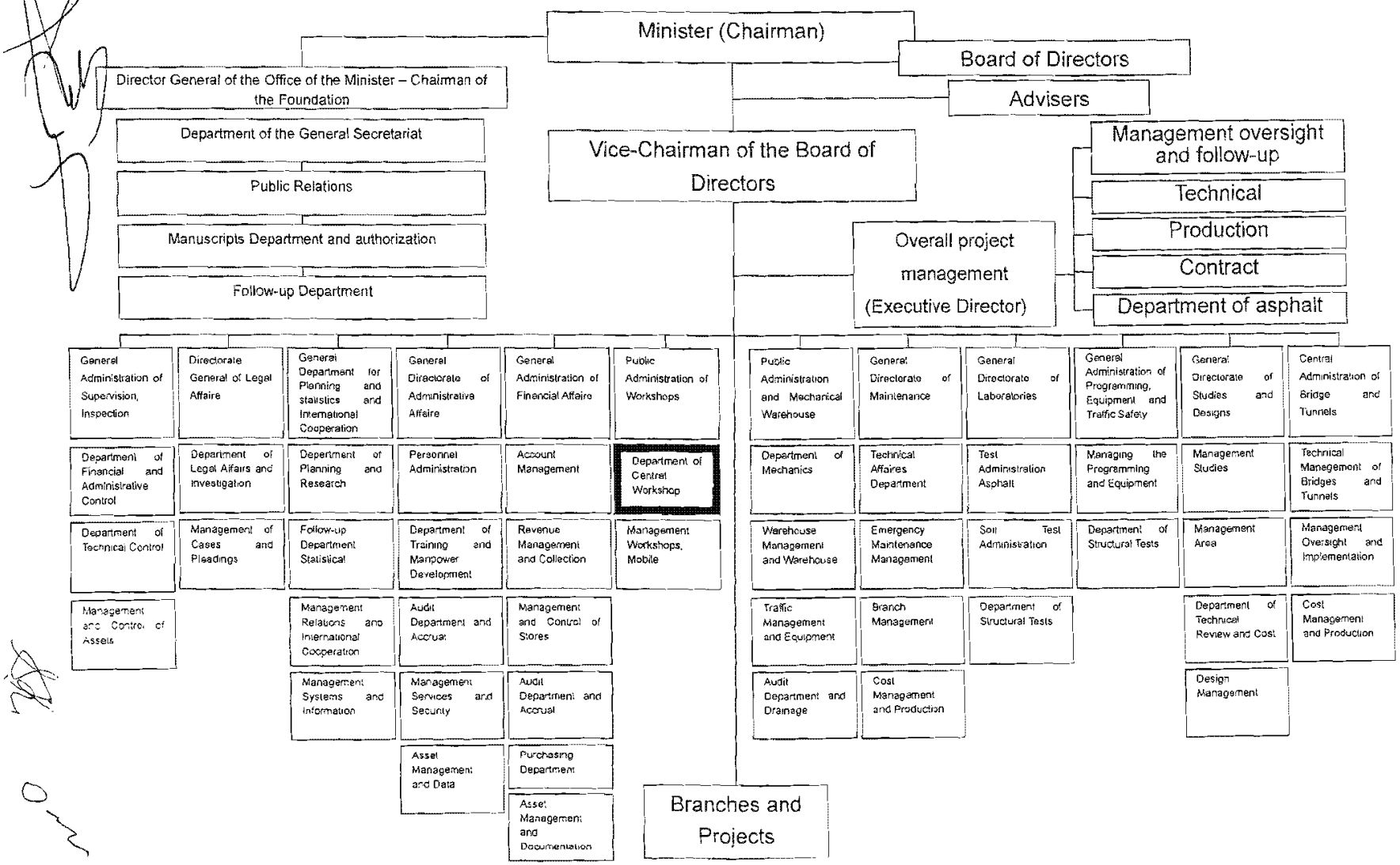
SANA'A City

Road Construction Machinery Workshop at NUKUM

Annex-2 Organization chart of the Ministry of Public Works and Highways



Annex-3 Organization chart of General Corporation for Road and Bridge



Annex-4-1

The list of equipment

No.	Items (Specification)	Quantity
	Engine Section	
1	Vibro-Centric Valve Seat Grinder (Capacity Valve Seat: ϕ 28-60mm)	1
2	Valve Seat Remover Set	2
3	Universal Puller for Wet Type Sleeve (Removable Sleeve Size: ϕ 76.2-165mm)	3
4	Turning Device for Sleeve Counter Bore	1
5	Diesel Timing and Tacho Tester	2
6	Diesel Compression Gauge Set (Case: 410x300x127mm)	2
7	Timing Length for Gasoline Engine	2
8	Volt Ampere Regulator Tester	5
9	Compression Gauge for Gasoline Engine (Gage: ϕ 75mm)	8
10	Vacuum Gauge for Gasoline Engine	5
11	Fuel Pressure Gauge (Gauge: ϕ 100mm)	5
12	Compound Gauge for Turbo Charger (Gauge: ϕ 75mm)	5
13	Cylinder Head and Cylinder Block Pressure Tester	2
14	Valve Spring Tester (Capacity: 240kg)	1
15	Connecting Rod Aligner (Connecting Rod: ϕ 50-105mm)	2
16	Bearing Heater / Piston Heater (Power Input: Ac 3ph 3 kW)	1
17	Air valve lapper	3
18	Valve Lifter & Compressor (2 Types)	2
19	Tachometer	2
20	Sling Chain Set	5
21	Nylon Sling (6 Types)	10
22	Lifting Bracket	20
23	Ajustable Sling (2 Types)	2
24	Hand Truck	20
25	Engine Almighty	2
26	Timing Fix Trun	2
27	Bearing Pullre (5 Types)	4
28	Gear Puller (3 Types)	4
29	Puller	4
30	Sling Chain Kit	3
31	Liner Puller	4
32	Piston Holder	4
33	Dianostic Equipment	2
34	Loadcell for Engine Dynamometer (Brake Power: 1,000PS)	1
	Fuel Injection Pump Section	
1	Diesel Fuel Injection Pump Tester (Pump Application:8 Cylinder)	1
2	Cummins PT Pump Tester (Speed Range: 450-4,200 rev/min)	1
3	Cummins PT Injector Test Stand (Motor: 1kw Sychronous)	1
4	Nozzle Tester (Pressure Gauge: 0-41 Mpa)	1
	Electric Section	
1	Battery Charger (DC Output: 50A)	2
	Hydraulic Section	
1	Curved Valve Lapping Machine (MVL)	1
2	Curved Rocker Lapping Machine (MRL)	1
3	Lapping Machine	1
4	Hydraulic Test Gauge Set	5
5	Only Gauge (2.5Mpa)	10
6	Only Gauge (6.0Mpa)	10
7	Only Gauge (25Mpa)	10
8	Only Gauge (40Mpa)	10
9	Only Gauge (60Mpa)	10
10	Portable Hydraulic Tester	2

No.	Items (Specification)	Quantity
11	Adaptor	2
12	Adaptor Kit for Komatsu	2
13	Adaptor Kit	1
14	Hose	3
	Machine Section	
1	Engine Lathe (Swing over Bed: 600mm)	1
2	Universal Milling Machine (Max.Travel: 750x300x450mm)	1
3	Shaping Machine (Max.Strok: 670mm)	1
4	Valve Seat and Guide Boring Machine (Valve Seat: ϕ 14.5-120mm)	1
5	Radial Drilling Machine (Distance of Spindle-Column: 3,125-410mm)	1
6	Drill Grinder (Grading Capacity: ϕ 13-32mm)	2
7	Upright Drilling Machine (Drilling Capacity: ϕ 40mm)	2
8	Hack Sawing Machine (Cutting Capacity: ϕ 350mm)	1
9	Brake Disc Lathe	2
10	Dial Vernier Caliper	2
11	Degimatic Caliper	2
12	Vernier Height Guauge	1
13	Digimatic Outside Micrometer (6 Types)	1
14	Caliper Gauge (5 Types)	1
15	Micrometer Stand	1
16	Dialr Test Indicato	1
17	Center Gaugi (3 Types)	1
18	Inbolute GaugiTooth Gaugi (8 Types)	1
19	Radius Gaugi (4 Types)	2
20	Screw Pitch Gaugi (4 Types)	2
21	Rockwell Hadness Tester	1
22	Surface Plate (Cast Ilon 500×500×75)	1
23	Surface Plate (Magnetic Tyep, 1000×500×250mm)	1
24	Surface Plate (Magnetic Tyep, 600×600×250mm)	1
25	Electric Pipe Threader	1
	Welding Section	
1	Radiator Repair Stand (Radiator Size: 1,727x1,219mm)	1
2	Automatic Gas Cutting Machine	2
	Chassis Section	
1	Portable Hydraulic Jack (Capacity: 50ton)	10
2	Transmission Jack (Capacity: 1,200kg)	2
3	Differential Gear Jack (Capacity: 600kg)	2
4	Differential Gear Jack (Capacity: 300kg)	2
5	Machinists Vise (Jaw Width: 103mm)	10
6	Wheel Inner Bearing Puller for Truck & Bus (Capacity: 140-170mm)	4
7	Brake Shoe Grinder (Capacity: ϕ 380-450mm)	2
8	Steering Wheel Puller	4
9	Master Pin Remover & Installer with Pump and Cylinder	4
10	Sprocket Remover & Installer with Pump and Cylinder	5
11	Bearing Heater (Min. Insude: ϕ 41mm)	2
12	Hot Water High Pressure Washer (Capacity: 1,800ℓ/h)	2
13	Hot Water High Pressure Washer (Capacity: 900ℓ/h)	2
14	Hydraulic Shop Press with Electric Motor (Capacity: 100ton)	2
15	Press Accessories for 100ton	2
16	Mechanic Tool Set for Large Vehicle	10
17	Mechanic Tool Set for Construction Equipment	10
18	Mobile Floor Crane (Capacity: 1ton)	1
19	Jet Parts Washer (Water Discharge: 350ℓ/min)	1

No.	Items (Specification)	Quantity
20	Height Speed Abrasive Cutting Machine (Outer Dia: ϕ 405mm)	2
21	Track Welder (MTW)	1
22	Track Link Hanger	1
23	Roller Welder (MRT-F)	1
24	Roller Hanger	1
25	Front Idler Hanger	1
26	Pack Lift Clamp	1
27	Flux Reclaimer	1
28	Flux	2
29	Stoody 105B	10
30	Jet Multiple Chisel (2 Types)	5
31	Spray Gun	5
32	Hoist (3ton)	1
33	Hoist (5ton)	1
	Tyre Section	
1	Heavy Duty Tire Changer (Rim Clamping Capacity: 14-52")	1
2	Heavy Duty Tire Changer for Truck	1
3	Tire Pressure Gauge (7 Types)	5
4	Tire Bead Removere (7 Types)	2
5	Wheel Dolly (2 Types)	2
	General Wprkshops Equipments	
1	Electrical Generator (450KW)	1
2	Screw Compressor with 300ℓ Tank (2.6m3/min, 22kw)	1
3	Mobile Workshop Bench (Max. Load :1,200kg)	10
4	Bench Electric Grinder (Wheel Size: ϕ 205x19x15.88, Power Source: Single AC)	5
5	Skid Loader (Min. Operating Weight: 900kg)	1
6	Forklift (Min. Loading:: 3ton)	2
7	Mobile Workshop with Front Winch (WD 4x4)	5
8	Tailor Truck Head with Low Bed (420HP)	2
9	Potable Welding Machine with Accessories (Diesel Engine, 500A)	4
10	Lubrication Truck (WD 6x4)	2
11	Die Grinder	3
12	Die Grinder	3
13	Resinoid Wheel Air Grinder	2
14	Resinoid Wheel Air Grinder	2
15	Hand Operated Pump (MT-700P)	2
16	Electrical Hydraulic Pump	2
17	Disc Grinder (2 types)	3
18	Torqe Wrench (Torque Preset RatcheType, 13 Classes)	1
19	Torqe Wrench (Dial Type, 17 Classes)	1
20	Gear Puller 2-Jaw Type (12 Classes)	1
21	2-Jaw,3-Jaw Combination Type (7 Classes)	1
22	Push-Puller (H Puller Type, 3 Classes)	5
23	Puller Accessories (Set No.8110, 8120, 8130, 8140, 4 Classes)	10
24	Female Threaded Adapters (4 Types)	10
25	Step Plate Adapters (3 Types)	10
26	Shaft Protectors	10
27	Bearing & Pulley Pulling Attachment (11 Types)	10
28	Internal Pulling Attachments (7 Types)	5
29	Slide Hammer Puller Set	2
30	Pilot Bearing Puller (3 Types)	1
31	Special Puropose Puller (4 Types)	1
32	Blind Hold Puller Set	2
33	Roller Bearing Puller Set	2

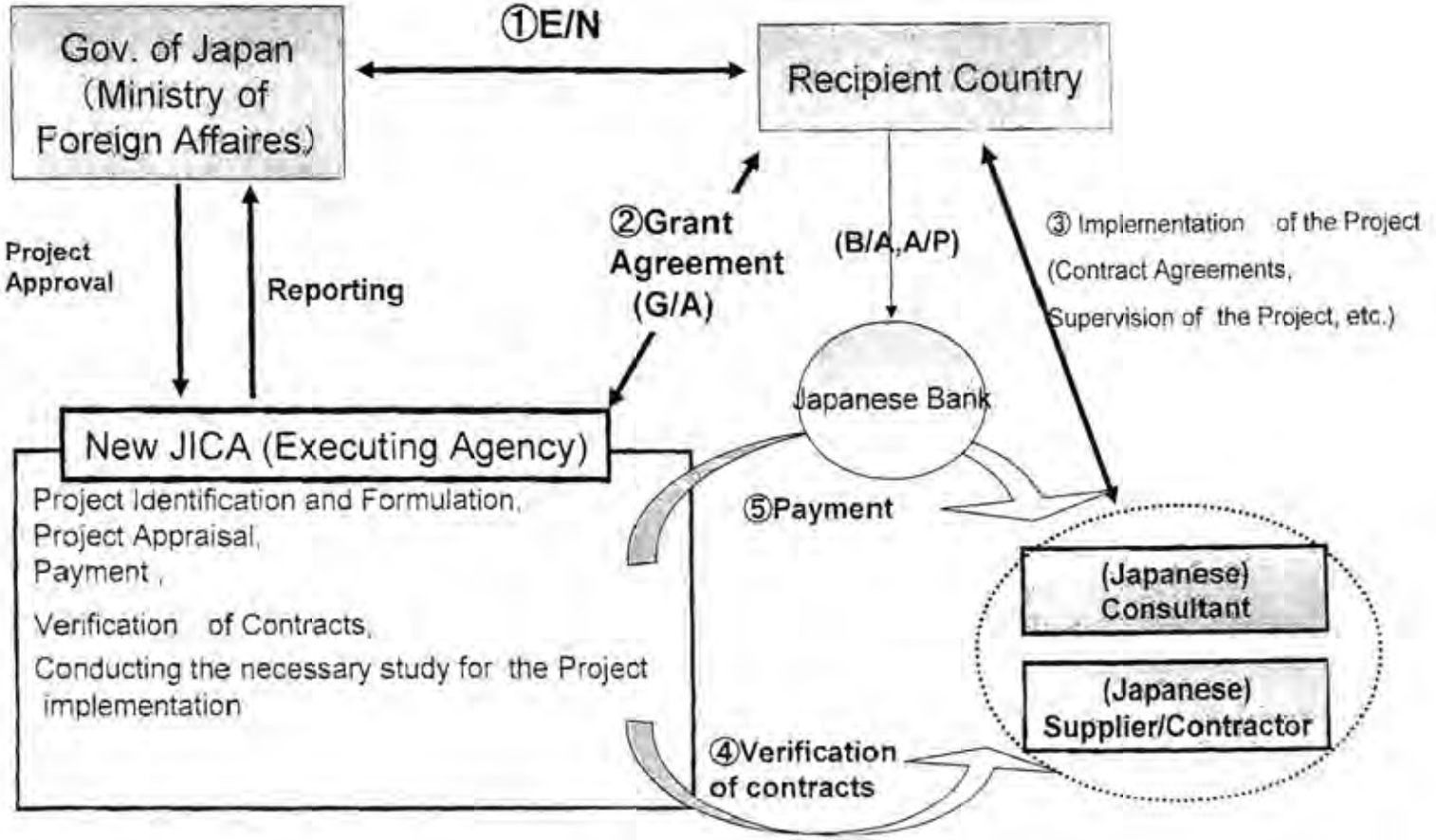
No.	Items (Specification)	Quantity
34	Puller Set (2 Types)	1
35	Bushing,Bearing & Seal Driver Set (5 Types)	2
36	Tube Cutting & Flaring Tools Set (3 Types)	4
37	Pipe Bender (2 Types)	3
38	Hydraulic Pipe Bender (2 Types)	1
39	Parts Cleaner (2 Types)	3
40	Jet Parts Washer (2 Types)	1
41	Hot & Cold Water & Steam	4
42	Hidh Puessuer Grease	5
43	Meduium Pressuer oil	5
44	Chassis Lubricator	4
45	Oil Libricator	4
46	Portable Lubricator	2
47	Portable Lubricator	2
48	Grease Pump	2
49	Oil Bucket Pump	2
50	Volume Pump	2
51	High Pressuer Grease Pump	4
52	Drum Pump (DC12V)	4
53	Drum Pump	2
54	Drum Can Carrier	4
55	Truck Crane (50 ton)	1
56	Dumper	2

Annex-4-2

The list of equipment used for the road maintenance projects and emergency works

ITEM NO	DESCRIPTION	QTY	OPERATING WEIGHTING	CAPACITY	PRIORITY			REMARKS
					A	B	C	
1	Asphalt Distributer.	2	MIN. 250 HP	MIN.(10 TONS)		1	1	
2	Asphalt Cutter.	4	MIN. 13 HP	MIN. 125 KG		2	2	
3	Bitumen Heaters And Power Sprayer.	6	TO BE SPECIFIED	1500-2000 LITERS	2		4	
4	Wheel Loader.	2	MIN. 150 HP	13200 KG	2			
5	Backhoe Loader	8	MIN. 90 HP	7000 KG	2	2	4	
6	Combined Roller With Trailer.	6	TO BE SPECIFIED	MIN. 2 TONS	2	2	2	
7	Mortor Grader.	4	MIN. 135 HP	MIN. 10 TONS	2	2		
8	Single Smooth Drum Vibration Roller.	8	MIN. 70 HP	MIN. 6 TONS	2	2	4	
9	Water Tank Trucks.	4	MIN. 250 HP	10000 LITERS	2		2	
10	Dumb Trucks.	14	MIN. 120 HP	MIN. 6 TONS	4	4	6	
11	Diesel Tank Trucks.	2	MIN. 210 HP	7000 LITERS			2	
TOTAL		60			18	15	27	

Respective roles for concerned authorities after October 2008



Annex-6

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure the space for installation of the equipment and facilities to be supplied.		•
2	Preparatory works for the installation including removal of equipment and facilities to be replaced, flooring, and electric cable wiring.		•
3	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
4	To ensure unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
5	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		•
6	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		•
7	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		•
8	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		•

(B/A: Banking Arrangement, A/P: Authorization to pay)

Annex-7

The Year 1998 Pertaining to the Establishment of the General Corporation for Roads and Bridges (Republic Decree No.269 for the year 2000)

Republican Decree No. (269) For The Year 2000
Concerning The Amendments Of Some Provisions Of Republican Decree No. (5) For The Year 1998 Pertaining To The Establishment Of The General Corporation For Roads And Bridges

President of the Republic:

After having perused the:

- Constitution of the Republic of Yemen,
- Law no. (35) for the year 1991 concerning public authorities, establishments and companies and its amendments,
- Republican Decree no. (5) for the year 1998 concerning the establishment of the General Corporation for Roads and Bridges,

Republican Decree no. (72) for the year 1998 concerning the formation of the Cabinet and nomination of its members and

- based on the proposal of the Minister of Constructions, Housing and Urban Planning

Decided the Following

Article (1): Article (13) of the Republican Decree no. (5) for the year 1998 concerning the establishment of the General Corporation for Roads and Bridges shall be amended so that its text shall be as follows:

Article (13) Corporation's Board of Directors is formed as follows:

1- Minister of Constructions, Housing and Urban Planning	Head
2- Vice Chairman of Board of Directors of the Corporation	Member
3- Deputy Minister of Constructions, Housing and Urban Planning for Construction Sector	Member
4- General Director of Road Directorate	Member
5- Representative of Ministry of Finance	Member
6- Representative of Ministry of Planning and Development	Member

7- Representative of Road Maintenance Fund Member

Board of Directors will have a headquarter and be appointed through Ministerial Decree.

Article (2): This law will come into effect on its promulgation and be published in the official newspaper.

Issued by the Presidency of the Republic – Sana'a

Date: 13 / 06 / 1421
Date: 13 / 08 / 2000

Ali Abdullah Saleh
President of the Republic

Dr. AbdulKareem Al-Eryani
Prime Minister

Republican Decree No. (5) For The Year 1998
Concerning The Establishment Of The General Corporation For Roads And Bridges

President of the Republic:

After having perused the:

- Constitution of the Republic of Yemen,
- Law no. (35) for the year 1991 concerning public authorities, establishments and companies and its amendments,
- Republican Decree no. (12) for the year 1995 concerning the Organizational Bylaw of the Ministry of Constructions, Housing and Urban Planning,
- Republican Decree no. (153) for the year 1997 concerning the formation of the Cabinet and nomination of its members,
- Based on the proposal of the Minister of Constructions, Housing and Urban Planning
- And after the approval of the Cabinet

Decided the Following

Chapter One
Establishment of Corporation and its Duties

Article (1) In conformity with this Decree, a public corporation is established and named ((General Corporation for Roads and Bridges)) through the incorporation of

Road Authority established under law no. (33) for the year 1975 and its amendments in law no. (20) for the year 1980 and Road Authority (in Aden) established under law no. (19) for the year 1986.

Article (2) By this Decree, all properties and assets of the two incorporated authorities will return to the corporation and to the corporation will return all lands, constructions, equipments, fixed, movable & current assets, rights and liabilities of the two incorporated authorities.

Article (3) The Corporation enjoys the body corporate and the independent financial obligation and subjects to the supervision of the Minister of Construction, Housing and Urban Planning.

Article (4) The location of the Corporation's headquarter is Sana'a City. The Minister, based on the presentation of Chairman of board of directors and the approval of the board of directors, may issue a decree to establish the corporation officers or branches in any city or governorate of the Republic. The decree defines the geographical area of the office.

Objectives, Tasks and Duties

Article (5) The Corporation aims at implementing projects in the field of bridge building, road construction, asphalt & maintenance as it is a governmental public contractor exercising and performing its activities through adopting modern economic management methods in order to cover its expenditures and operation costs and attain economic & financial returns enabling it to develop its activities and modernize its techniques in accordance with the Constitution, valid laws and general State's policies through which the Corporation exercises and performs the following tasks and duties:

1. Participation in tenders as a contractor for the implementation of investment or governmental or cooperative projects to construct roads, maintain or implement them, as per the tender requirements.

2. Implementation of roads and bridges construction and maintenance projects entrusted to the Corporation through direct order from the Ministry.

3. Review of technical & engineering studies & designs, quantity estimation and cost of projects that the Corporation will implement or make open to tenders or are entrusted to it by the Ministry.

4. Supervision on truck weigh stations on the different roads in the Republic.

5. Production and manufacturing of road construction materials, using them or selling them in accordance with the approved specifications and criteria.

6. Setting up necessary plans & schemes for the qualification and training of local cadre specialized in the field of road construction and maintenance in liaison with concerned bodies.

7. Pursuit of modern engineering & technical developments and utilizing them in the qualitative improvement of its tasks and activities.

8. Any other tasks necessitated by the nature of its works or entrusted to by the Minister.

Corporation's Authorities

Article (6) After the approval of the Minister, the corporation, in a way to realize it aims, practices the following authorities and powers in conformity with Law and provisions of this Decree:

1. Purchasing and selling construction and asphalting equipments and machineries and asphalt materials production tools.

2. Establishing branches or offices for the Corporation in the governorates of the Republic. Decree of their establishment defines office tasks, duties and its geographical area.

3. The right of possessing & owning (lands) and fixed & movable assets, the right to dispose of them, the right of litigation, borrowing & contracting with others in all that is related to its activities and accepting local & foreign grants and assistances in accordance with the valid laws and decrees.

Chapter Two

Corporation Financial System

Article (7): The capital of the Corporation is made up of:

A- Funds allocated by the State for the corporation

B- Net assets of the two road authorities referred to in article (2) of this decree.

Article (8): Funding resources of Corporation are made up of:

A- Corporation's capital

B- Special resources of Corporation's activities for the works it implements

C- Loans and credit facilitations

D- Assistances, donation and grants that corporation may get in accordance with valid laws

E- Funds given by the State within the Corporation's annual budget

F- Any other sources approved by the Board of Directors and allowed by Law.

Article (9) All Corporation's property, assets and possessions of State's public property subject to control and financial & accounting inspection and auditing by the Central Organization for Control and Auditing.

Article (10) Corporation's financial system subjects to the standard financial system of public corporations in the Republic. Corporation's financial year starts by the start of financial year of the State and ends by the end by the end of the State's financial year.

Article (11) Corporation prepares estimate budget for itself similar to commercial budgets and account holding on commercial & accounting bases, prepares final accounts sheets, financial status lists and submit them to the Minister and other bodies stated in the law within three months of the end of the financial year.

Article (12) Financial plan approved by the Board of Directors after the ratification of the Minister is sent to the concerned bodies for the completion of legal procedures.

Chapter Three

A- Corporation Board of Directors

Article (13) Corporation's Board of Directors is formed as follows:

1- Chairman of Corporation's Board of Directors	Head
2- Vice Chairman of Board of Directors of the Corporation	Member
3- Deputy Minister for Construction Sector	Member
4- General Director of Road Directorate	Member
5- Representative of Ministry of Finance	Member
6- Representative of Ministry of Planning and Development	Member
7- Representative of Road Maintenance Fund	Member

Board of Directors will have a headquarter and be appointed through Ministerial Decree.

Article (14) Bodies represented in the Board nominate their representatives divided that they are not below the position of General Director. Nominations are submitted to the Minister to obtain the decree of their nomination from the Prime Minister.

Article (15) Minister may request the body represented in the Board to nominate another person for the Board membership if the body's representative fails to perform his/her functional duties or absents from sessions for four consecutive sessions without an acceptable excuse.

Article (16): Tasks and Duties of Board of Directors:

The Board is the supreme administrative authority in the Corporation and has powers of supervision, guidance, outlining policies whereby the Corporation works, approval of plans & schemes aiming at the realization of its objectives & goals. The Board makes required & necessary decisions for the implementation of Corporation's tasks and duties in accordance with the provisions of this Decree and valid laws. And the Board, specifically, practices and exercises the following tasks and duties:

1. Outlining necessary policies for running the Corporation's activities and realizing its aims in accordance with the provisions of Law and this Decree.
2. Approving Corporation's administrative & financial bylaws and regulations.
3. Reviewing and approving investment, financial & human plans and schemes of implementing Corporation's tasks and activities.

4. Monitoring Corporation's activities, discussing the reports submitted by the Chairman of Board and taking necessary decisions wherefore.

5. Studying and approving contracts that Corporation makes with others in the field of investment projects, loans, credit facilities etc.

6. Setting up financial policy required for the development of Corporation's resources and securing necessary financial allocations of local and foreign exchange for the implementation of current and investment projects.

7. Approving draft annual financial plan of the Corporation and working on the auditing of estimates of resources and expenditures in the planned budget that ensure the development of resources and reduction of expenditures.

8. Approving of the Corporation's general budget, annual account statements and the results of the annual inventory.

9. Developing Corporation's administrative structure and presenting it to the Minister to make appropriate decision.

10. Proposing the modification of Corporation's capital.

11. Approving the nomination of directors of departments and heads of branches of Corporation pursuant to the recommendations of the General Director and the Minister's approval in accordance with valid laws and regulations.

12. Studying issues that Chairman of Board considers presenting them to the Board.

13. Endorsing purchase lists of heavy or strategic equipments and machineries for the Corporation

Article (17) Board convenes, at least once a month, upon written invitation from the Chairman. Boar convenes in case of emergency in which Chairman of Board or one third of its members think it is necessary to convene to urgently take a decision. Board may form a committee from amongst its members to study any issue related to Board's duties and present the results of the study to the Board to take required decision.

Article (18) Minutes and decisions of the Board of Directors are submitted to the Minister

within fifteen days from the date of their issuance. Minister has the right to fully or partially reconsider those minutes & decisions within utmost period of one month from the date of submission to him/her. The elapse of time, with no objection from Minister, is tantamount to approving them. Yet, not presenting these decisions within the defined period renders them null and the Minister has the right to stop them.

Article (19) Board of Directors convenes with the chairmanship of the Minister and upon an invitation from him/her when he/she thinks it is necessary for him/her to attend the Board's meetings to discuss any issues or decisions related to the administration of the Corporation or its activities or financial status or annual plans and schemes. However, it is a condition that the meetings attended by the Minister shall not be less than three meetings in a year and such meetings may convene at the Minister's office or Corporation's headquarter or any other place.

Article (20) Board's meetings are valid in the presence of the majority of its members and decisions are made by the majority of votes of presents members. When votes are in tie, preponderance is given to the side of which the chairman of the meeting is.

Article (21) Board of Directors may invite any person of experience or competence to attend Board's meetings without having a countable vote in the Board's deliberations.

Article (22) Minister presents to the Cabinet or to the Prime Minister the issues he/she considers necessary to be presented and are falling under the Corporation's duties or policy or the purpose it has been established for.

Article (23) Any member of the Board having a personal interest in any issue or proposal or decision presented to the Board of Directors shall submit to the Board a memorandum in which he/she explains the nature of interest he/she correlates to that issue. He/she shall refrain from attending Board's sessions in which this issue is discussed and may not take part in any deliberation or decision Board makes regarding to this issue.

With a justifying memorandum, the Minister or Chairman of Board may request the non-presence of the one having personal interest in the Board's meetings.

Article (24) Chairman of Board or any Board member may not be a chairman of a board of directions or an administrative member of a corporation or a company competing with Corporation's activities or run a private activity similar to or competing with its activities.

B- Chairman of Board of Directors

Article (25) Chairman of Board of Directors undertakes the following tasks and duties:

1. Administrating & running the Corporation, handling its business, following-up the implementation of Board's decisions and preparing reports on the reasons and justifications of delay or no implementation.
2. Inviting for the convention of Board, determining agenda and submitting a copy of the agenda to the Minister prior to Board convention.
3. Submitting copies of minutes of meetings and decisions of the Board to the Minister within fifteen days from the date of Board's approval and inform the Board of the Ministers' ratification of them.
4. Representing Corporation at home and abroad when representation is at his/her level.
5. Standing for Corporation before the judiciary.
6. Proposing Corporation's financial plan & general budget and supervising their implementation in accordance with the Board's decisions.
7. Signing with others on the contracts approved by the Board.
8. Proposing organizational regulations and decisions related to Corporation's works.
9. Implementing Board's decisions of nominating, discharging, shifting or assigning Corporation's employees or opening new branches.
10. Submitting and presenting the results of the annual inventory and final accounts to the Board.
11. Whatever tasks Minister asks him/her to do.

C- Vice Chairman of Board

Article (26) Vice Chairman of Board of Directors undertakes the tasks and duties of the Board Chairman in the Chairman's absence. Corporation's organizational bylaw defines his/her tasks and duties.

Chapter Four

Final Provisions

Article (27) The Corporation enjoys all advantages and exemptions stated in investment law or other valid laws.

Article (28) Organizational bylaw of Corporation is issues by Minister's decree after the approval of the Board and in coordination with the two Ministers of Civil Service and Finance. The two Ministers issue necessary decrees and orders to implement this Decree and realize its aims.

Article (29) Provisions concerning public corporations in the laws of public authorities, establishments and companies shall be applied to issues that are not stated in this Decree.

Article (30) The body corporate of the two authorities referred to in article (2) of this Decree shall be removed upon the issuance of this Decree in accordance with law no. (35) of the year 1991 concerning public authorities, corporations and companies.

Article (31) All previous decrees contradicting with the provisions of this Decree shall be revoked.

Article (32) This Decree shall come into effect on its promulgation and be published in the official newspaper.

Issued by the Presidency of the Republic

Date: / / 1418

Date: / / 1998

Eng. Abdullah Hussein Al-Daf'ei
Minister of Construction, Housing and Urban Planning

Dr. Faraj Bin Ghanim
Prime Minister

Ali Abdullah Saleh
President of the Republic

At the time of Briefing Survey for Outline Design

Minutes of Discussions
on the Preparatory Survey
on the Project for Upgrading and Revitalization
of Road Construction Machinery Workshop at Nukum
in Republic of Yemen
(Explanation of Draft Basic Design)

In October and November 2009, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Upgrading and Revitalization of Road Construction Machinery Workshop at Nukum (hereinafter referred to as "the Project") to the Republic of Yemen, and through discussions, field survey and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult with the concerned officials of the Government of the Republic of Yemen on the contents of the draft report, JICA sent to Yemen the Basic Design Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Shuntaro KAWAHARA, Senior Adviser to the Director General, Economic Infrastructure Department, JICA from January 16 to 21, 2010.

As a result of discussions, both sides confirmed the main items described in the attached sheets.

Sana'a, January 20, 2010

Shuntaro Kawahara
Leader
Basic Design Explanation Team
Japan International Cooperation Agency

Eng. Omar A. Al-Korshumi
Minister of Public Works and Highways
Chairman of Board of Directors
General Corporation for Road and Bridges
The Republic of Yemen

Witness

Eng. Hisham Sharaf Abdalla
Vice Minister
of Planning & International Cooperation
The Republic of Yemen

ATTACHMENT

1. Components of the Draft Report

The Yemeni side agreed and accepted in principle the contents of the Draft Basic Design.

2. Cost Estimation

Both sides agreed that the Project Cost Estimation as attached in Annex-1 should never be disclosed to any third parties before the signing of all the contract(s) for the Project.

3. Japan's Grant Aid Scheme

The Yemeni side has shown a full understanding of the Japan's Grant Aid scheme and the necessary measures to be taken by the Yemeni side as explained by the Team and described in the Annex-6 of the Minutes of Discussions signed by both sides on October 28, 2009.

4. Schedule of the Study

JICA will complete the Final Report in English, in accordance with the confirmed items and send it to the Yemeni side by the mid of March, 2010.

5. Other Relevant Issues

(1) The Yemeni side confirmed that the following items shall be undertaken by the concerned organizations of Yemen.

a) Construction of Generator House, Radiator House and Tire Repair House;
b) Renovation of Compressor Room;
c) Required Arrangement for Existing Facilities and Equipment (Clear and/or Move);
d) Electric Cable Wiring;
d) Compressed Air Piping;
e) To allocate budget for the commissions for the banking services based upon banking arrangement (B/A); and
f) Tax exemption and custom clearance of the products at the port of disembarkation.

(2) The Yemeni side confirmed that it will secure the budget and personnel necessary for proper maintenance and operation of the facilities constructed and equipment purchased under the Project.

(3) The Japanese side explained that the Project would not include procurement of construction machines used in road project sites since limited fiscal resource should be concentrated on rehabilitation and upgrading of the Workshop in order to effectively utilize existing construction machines owed by the General Corporation for Road and Bridges, and that the Government of the Republic of Yemen would have to newly send the Government of Japan the Note Verbal requesting assistance if the former needs Japanese grant-aid for procuring new road construction machines excluded from the Project.

(4) JICA will consider to modifying the content of the List of Equipment to be procured by the Project as follows:

a) To add 1 unit of "Electric distribution panel";
b) To add 2 units of "Portable air compressor";
c) To alter quantity of "High pressure grease drum pump with hose reel" from 5 units to 2 units; and
d) To alter quantity of "Medium pressure oil drum pump with hose reel" from 5 units to 2 units.

The above mentioned amendment is subject to budget constraint of the Government of Japan, and is to be incorporated in the final report of the Preparatory Survey on the Project.

(5) JICA will examine the necessity of a new Transformer.

(6) Yemeni side agreed that the General Corporation for Road and Bridges will exert effort to improve the operational rate of its heavy duty equipment form 62% (present) to approximately 80% in 5 years after the accomplishment of the Project by utilizing the equipment procured by the Project.

(7) Yemeni side agreed that General Corporation for Road and Bridges will prepare photographs and records of activities of its road construction such as length of newly constructed and repaired roads in order to review impact of the Project.

Annex-1 Project Cost Estimation

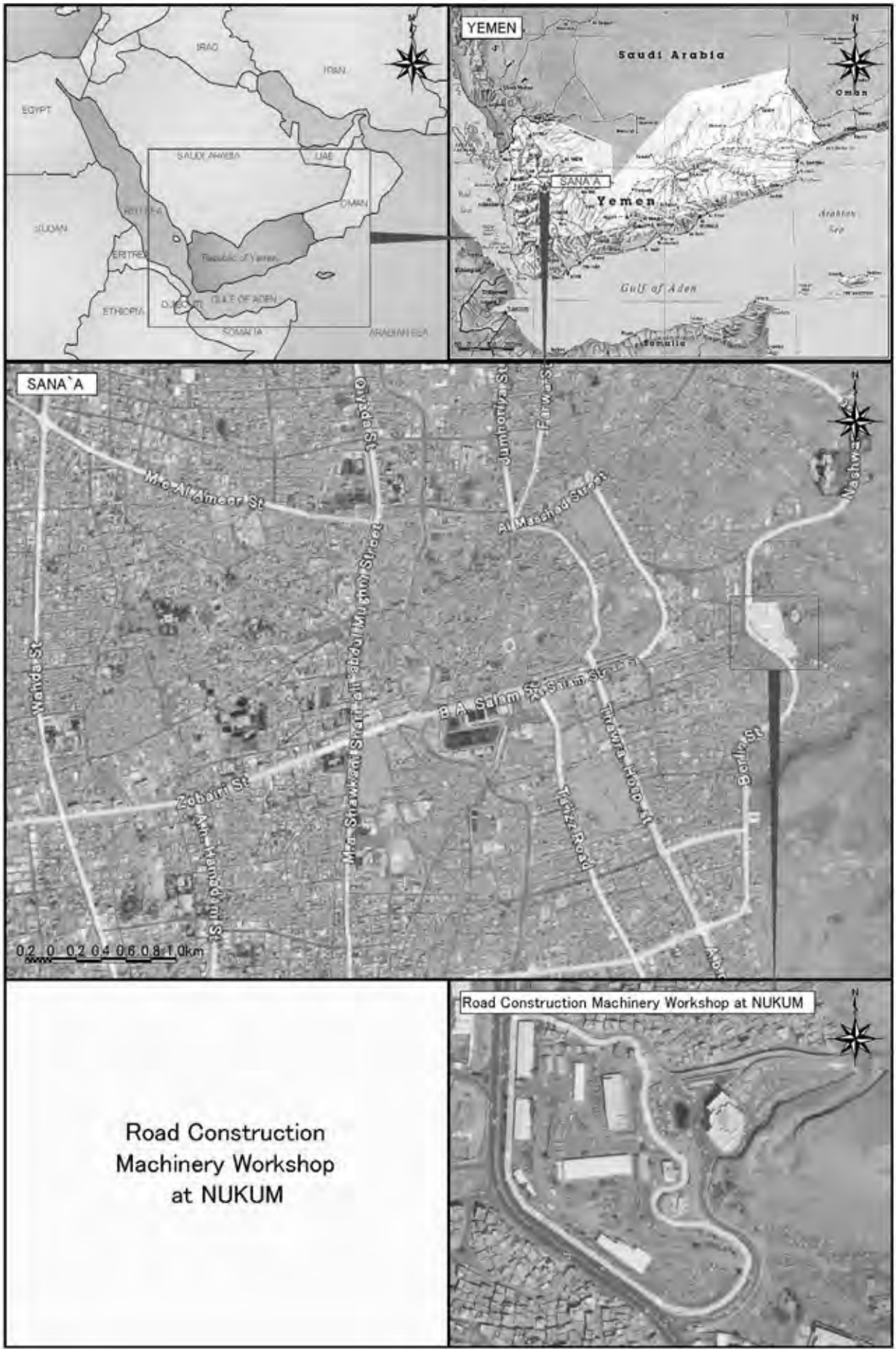
Appendix 5. Soft Component (Technical Assistance) Plan

THE PROJECT FOR UPGRADING AND REVITALIZATION OF ROAD CONSTRUCTION MACHINERY WORKSHOP AT NUKUM IN REPUBLIC OF YEMEN

SOFT COMPONENT (TECHNICAL ASSISTANCE) PLAN

March 2010

JAPAN INTERNATIONAL COOPERATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL



Location of the Project Site

Contents

Location of the Project Site

1. Backgrounds for Planning Soft Component

Currently, there are 159 staff members in the Road Construction Machinery Workshop and 78 members of them engage in actual repairing and maintenance activities for construction machineries. These members consist of young inexperienced workers, mid-level workers and skilled workers, so they are on the whole well balanced. However, as often seen in developing countries, skills and knowledge acquired remain individual, that is, they are not systematically passed on to other staff members. Partly because of this, some items supplied through Japanese aid in 1992 are made use of only partially. Thus, it is necessary to provide the staff members of the Road Construction Machinery Workshop with technical assistance (soft component) in order to have them familiar with the usage of equipment to be newly procured, as well as that of the existing equipment, and to strengthen their technical capability of operating, maintaining and managing the equipment through educational programs to be carried out.

2. Objectives of Soft Component

The direct effects expected by the implementation of this Project are as follows:

(i) The upgrading and development of repairing and maintenance machineries will increase the number of active construction equipment that is owned by the GCRB from the current 620 to 800.

(ii) The implementation of the soft component will improve the capability of operating, maintaining and managing repairing equipment.

The objectives are to enable the Road Construction Machinery Workshop to effectively operate, maintain and manage the repairing and maintenance equipment so as to increase the operating rate of the construction equipment from the current 62% to 80% in five years' time after the completion of the Project, and maintain the attained operating rate afterwards.

3. Outputs of Soft Component

(i) Drawing up and making use of manuals will make it possible to repair and maintain the equipment sustainably and independently.

(ii) Lectures and practical training will make it possible to repair and maintain the equipment on its own accord.

4. Methods of Confirming Accomplishment of Outputs

The accomplishment of outputs of lectures and practical training will be confirmed by means of examinations to be conducted during the soft component.

5. Activities of Soft Component (Input Plan)

5.1 Implementation Method

(1) Prior Work in Japan

1) Drawing up of Manuals

Where the usage of machineries and the implementation of repair and maintenance of construction equipment with the machineries are concerned, manuals for the usage and methods of repair will be drawn up for equipment, of which the staff members lack knowledge and handling capability. At the same time, since the Road Construction Machinery Workshop have no adequate management capability, manuals for planning repair and maintenance of equipment will be also drawn up.

2) Confirmation of Implementation Schedule

Based on the information gathered during the periods of procurement and installation of equipment, confirm the implementation schedule of the field work.

(2) Field Work

1) Selection of Educational Equipment

Calibration materials, parts and machine tools to be used for practical training will be selected.

2) Making the Soft Component Plan Widely Known

By making persons subject to the training and education familiar with the contents, schedule and other aspects of the plan, and adjusting work schedules, the schedule of the plan will be determined. The persons subject to the training and education will be selected out of the staff members and machinery mechanics affiliated to the Road Construction Machinery Workshop in accordance with the contents of the training and education.

3) Implementation of Technical Assistance

Lectures, practical training, examinations and reviewing sessions will be conducted for the following issues:

- Disassembling of engines; operation of performance tests, and records management
- Operation of injection pump testers, and records management
- Operation of performance tests of hydraulic pumps, motors and transmissions, and records management
- Operation of testers for alternators and starters, and records management
- Operation of new equipment (such as rollers and track welders), and records management
- Methods of drawing up repairing and maintenance plans (management)

The implementation schedule of technical assistance will be shown in Tables 5.1~5.3.

Table 5-1 Implementation Schedule of Soft Component (1/3)

Education plan concerning inline fuel pump tester, PT, pump injector test stand, and engine dynamometers

No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning inline-type fuel injection pumps**																															
1	Structures and functions of inline injection pumps, and operation and maintenance method of testers		AM	Lecture: pumps and testers																												
2	Disassembly and partial inspections: delivery valves, tappets, plungers, etc.		PM	AM	Practical training: disassembly																											
3	Assembly: bearings, camshafts, tappets, plungers, etc.				AM	AM	Practical training: assembly																									
4	Use of testers: usage of special tools and adjustment methods (OJT)								AM	AM	AM	Practical training: adjustment methods (OJT)					Calibration practical training: OJT						Calibration practical training: OJT							Review		
5	Days for confirmation tests and review											AM	Tests															Tests		Review		
*	**Education concerning Cummins PT pumps**																															
1	Structures and functions of PT pumps, names of PT pumps, meanings of signs on plates, etc.															AM	AM	Lecture: pumps and testers														
2	Disassembly and partial inspection of PT pumps currently in use (OJT)															PM	PM	Practical training: disassembly (OJT)														
3	Assembly of PT pumps currently in use (OJT)																	Practical training: assembly (OJT)														
4	Use of testers: usage of special tools and adjustment methods (OJT)																	Practical training: OJT					Calibration practical training: OJT									
5	Days for confirmation tests and review																											Tests		Review		
*	**Education concerning usage of Cummins injector test stand**																															
1	Usage of testers and methods of data description (OJT)								PM	PM	PM	Lecture: test methods				Calibration practical training: OJT							Calibration practical training: OJT							Review		
*	**Education concerning methods of assembly and disassembly of engines and usage of**																															
1	Assembly and disassembly of engines (OJT): usage of special tools and measuring methods			PM	PM	PM	Practical training: usage of special tools																									
2	Usage of engine testers: calculation of horsepower and fuel consumption, etc.											Usage of testers				Practical training of engine hp testers							Practical training of engine hp testers									
3	Methods of data description concerning tests of engine horse power (OJT)										Methods of data description					Practical training of engine hp testers							Practical training of engine hp testers							Review		
4	Days for confirmation tests and review																											Tests		Review		

Remarks	1. Education concerning inline fuel pump	2. Education concerning PT pump testers	3. Education concerning injector test stands	4. Education concerning engine dynamos
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; Engine model; pump type (e.g.) PE-A type; and serial No. (e.g.) 12345, will be clarified in advance. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; PT pump names; and plate signs, will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; injector No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; Engine model; serial No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.

Table 5-2 Implementation Schedule of Soft Component (2/3)

Education plan concerning assembly and disassembly, and test methods of hydraulic devices (pump motors and transmissions)

No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning hydraulic pumps and motors**																															
1	Hydraulic pumps: structures and functions of gear pumps, piston pumps, clinoaxis pumps, and skew plate	Lecture: pumps and testers																												Review		
2	Disassembly and partial inspections of hydraulic pumps currently in use (OJT)	Practical training: disassembly & assembly																														
3	Hydraulic testers: structures, functions, operation, and maintenance methods				P M	P M	Practical training: testers																									
4	Use of testers: usage of special tools and adjustment methods (OJT)								A M	A M	A M	Practical training: OJT on calibration methods																		Review		
5	Days for confirmation tests and review												Tests																			
*	**Education concerning transmissions and control valves**																															
1	Assembly and disassembly of missions (OJT): usage of special tools and measuring methods								Lecture: functions of missions																					Review		
2	Disassembly and assembly of missions currently in use (OJT)											P M	P M	Practical training: OJT on disassembly																		
3	Use of testers: bench tests and adjusting methods (OJT)															Practical training: OJT on bench tests																
4	Days for confirmation tests and review																	Practical training: OJT					Practical training: OJT on bench tests									
5	Usage of testers and methods of data description (OJT)																				Practical training: OJT on bench tests						Tests		Review		
*	**General knowledge of hydraulic pressure**																															
1	General knowledge: principles of hydraulic pressure, hydraulic pressure and flows, viscosity, phenomenon unique to hydraulic pressure, outlines of hydraulic						As needed					As needed									As needed						Tests			Review		
*	**Methods of creating equipment for tests**																															
1	Flanges, joints, pipes, and others						As needed							As needed							As needed						As needed					
*	**Rapping machines**																															
1	Usage of rapping machines						As needed							As needed							As needed						As needed					
2	Maintenance and inspections of rapping machines						As needed							As needed							As needed						As needed					

Remarks	1. Education concerning hydraulic pump testers	2. Education concerning hydraulic motor	3. Education concerning transmissions	4. Education concerning control valves
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; Engine model; pump type and No., will be clarified. * Serial No. (e.g.) 12345 etc. will be clarified in advance. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; Engine model, will be clarified. * Motor type and No. will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; serial No.; transmissions No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) GD-705-4; model year (e.g.) 1995; Engine model will be clarified. * Serila No. will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.

Table 5-3 Implementation Schedule of Soft Component (3/3)

Education Plan concerning electric devices, track welders, roller welders, and management (upgrading and repairing)

No.	Item \ Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
*	**Education concerning electricity: voltage, electric current, resistance, usage of test bench, batteries,**																															
1	Voltage, electric current, resistance, usage of testers, batteries, electric circuits, and electric devices (basics of alternators and starters)		A M		Lecture: basics of electricity																											
2	Disassembly and partial inspections: disassembly of alternators and starters, inspection methods, and		P M	P M	Practical training: disassembly and inspections (OJT)																											
3	Test methods with test bench: alternators (restraint test, no-load test, output test, notices at the time of tests, and methods of data description)				A M	A M			Practical training: assembly and bench tests (OJT)							Bench tests practical training : OJT			Review			Bench tests practical training : OJT				Review			Review		
4	Test methods with test bench: starters (adjusting voltage, no-load test, output test, notices at the time of tests, and methods of data description)				P M	P M			P M	P M	P M					Bench tests practical training : OJT				Review		Bench tests practical training : OJT				Review			Review		
5	Days for confirmation tests and review												Tests														P M	Tests		Review		
*	**Usage of track welders and roller welders**																															
1	Structures, functions and operation methods: the order of weld overlay on the surface to run the roller, and the order of weld overlay on roller flanges									A M	A M	A M	A M			A M	A M						A M	A M	A M	A M						
										Lecture		Practical				Practical training: OJT							Lecture		Practical							
2	Method of weld overlay: notices after weld overlay for roller welder, twin head, with vacuum flux recovery, and notices for the order of weld overlay for track welder									A M	A M	A M	A M			P M	P M						A M	A M	A M	A M	P M					
										Lecture		Practical				Practical training: OJT							Lecture		Practical		Tests			Review		
3	Special characteristics and notice for storage, prevention of breakdown, and maintenance of welding wires and flux									Lecture		Practical						As needed														
*	**Repairing and upgrading plan (management education)**																													Review		
1	Maintenance, inspection and management of factory facilities: management table for upgrading of equipment																				Lecture: method of drawing up of equipment lists										
2	Upgrading plan: methods of entry, intermediate, completion, shipping and other inspections																				Lecture: method of drawing up of equipment lists									Review	
3	Upgrading plan: methods of drawing up and filling upgrading records and inspection records																				Lecture: method of drawing up of equipment lists										
4	Safety education																					Lecture: notices of safety										
5	Education addressed to foremen, ranks of middle management, fresh recruits and workers on various																					Lecture: problems and proceeding										
6	Inventory check: arrival and shipping of partial goods																						Lecture: inventory							Review		
7	Confirmation tests																											Tests		Review		

Remarks	1. Bench tests of alternators	2. Starter bench tests	3. Education concerning weld overlay for track welder and roller welder	4. Management education
Existing machines will be used. * In the first stage of the session, lectures will be given concerning the structures, functions, notes on assembly and disassembly, maintenance, etc. * The second and final stages of the session will be devoted chiefly to practical training (OJT).	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; engine model; alternator serial No., will be clarified. * The numbers of alternator parts will be clarified. * Special tools and spare parts will be prepared.	* Information such as machines with the tester (e.g.) D155-3; model year (e.g.) 1995; serial No.; model; starter serial No., will be clarified. * Special tools and spare parts will be prepared. * Calibration data will be prepared.	* Information such as machines with the tester (e.g.) D155-3; serial No. will be clarified. * The numbers of track link and roller parts will be clarified. * Special tools and spare parts will be prepared. * Tables of standard values for weld overlay will be prepared.	* Preparation of teaching materials * Preparation of tables of maintenance, inspections, etc. * Preparation of materials for safety management * Preparation of inventory check lists, etc.

5.2 Implementation Resources

Table 5-4 Personnel Plan for Soft Component

Person in charge	Rate	Months	Work	Contents of Work
General supervisor	2	0.25	In Japan	Drawing up of the implementation plan and instruction manuals concerning management education
		0.33	On site	Implementation of on-site practical training concerning management and report concerning the outcomes of technical assistance to the organizations concerned
Technical instructor (1)	3	0.50	In Japan	Engine section: Drawing up of instruction manuals concerning injection pumps and engine dynamos
		1.00	On site	Implementation of on-site practical training concerning operation and management of devices related to engines
Technical instructor (2)	4	0.50	In Japan	Hydraulic section: Drawing up of instruction manuals concerning hydraulic devices (pumps and motor transmissions)
		1.00	On site	Implementation of on-site practical training concerning operation and management of hydraulic devices
Technical instructor (3)	4	0.50	In Japan	Underbody equipment and electricity-related equipment: Drawing up of instruction manuals concerning new underbody equipment and electricity-related equipment including electrical equipment
		1.00	On site	Implementation of on-site practical training concerning underbody equipment and electricity-related equipment including electrical equipment
Local assistant (1)	Local staff	1.00	On site	Assistance to Japanese technical instructors (1)
Local assistant (2)	Local staff	1.00	On site	Assistance to Japanese technical instructors(2)
Local assistant (3)	Local staff	1.00	On site	Assistance to Japanese technical instructors(3)

6. Procurement Method of Implementation Resources for Soft Component

For efficient technology transfer in a short period of time, it is necessary to allocate personnel who are familiar with the functions, structures and operation methods of equipment to be procured, and have experiences of providing instructions on equipment. It is also necessary to make systematically a plan for the flow from drawing up of various plans and manuals to on-site practical training, and to implement and supervise the flow in accordance with the systematically prepared plan. In consideration of these conditions, it seems difficult to secure certain outcomes with local resources only. Thus, the soft component will be planned as a direct assistance by a Japanese consultant who is familiar with soft component and has work experiences.

7. Implementation Schedule of Soft Component

Table 7-1 Implementation Schedule of Soft Component

Item \ Months since the commencement of the project		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Implementation schedule	Drawing up of manuals														▬	
	Instructions concerning operation and keeping management records															▬
	Instructions concerning methods of repairing and upgrading plans															▬
Personnel	Consultants (Japanese engineers)														▬	▬
	Consultants (locally employed)															▬
	Implementing organization of Yemeni Government															▬
Reports	Completion report															▼

8. Outcomes of Soft Component

Manuals:

* Manuals for drawing up repairing and maintenance plans (in English and Arabic)
* Manuals for repairing and maintenance of engine-related devices (in English and Arabic)
* Manuals for repairing and maintenance of hydraulic devices (in English and Arabic)
* Manuals for repairing and maintenance of underbody equipment (in English and Arabic)

Test Results:

The results of examinations conducted for persons subject to education after the lectures and practical training

9. Estimated Project Cost of Soft Component

The overall cost of the soft component is estimated at 14.0 million yen.

10. Responsibilities of the Implementing Organization of Yemen

(1) Securing of Personnel

For each content of educational programs shown below, the numbers of persons subject to the programs are as follows:

Table 10-1 Allocation of Persons at the Yemeni Side

Content of Education	Minimum Number of Persons
Education concerning engine (fuel pumps and dynamos) tests	7 persons
Education concerning tests of hydraulic devices	4 persons
Education concerning repairing of electrical equipment and underbody equipment	4 persons
Education concerning repairing and maintenance management	4 persons

(2) Securing of Budget

The Yemeni side will bear the following expenses.

* Labor cost (salaries of persons subject to the educational programs during the period when the technical education is conducted)

* Operation cost (electric power, maintenance and repair, and fuel costs during the period when the technical education is conducted)

(3) Implementation of Monitoring

In order to confirm the onset of project effects, the Yemeni side will conduct the following matters after the implementation of the Project.

* Records of equipment repairs (places of equipment subject to repair, and the number of repairs)

* Record of road maintenance (name of project, the scope of project, grade of road subject to the project, pictures of road work, etc.)

Appendix 6. References / List of Obtained Data

6. References / List of Obtained Data

Survey Name: THE PROJECT FOR UPGRADING AND REVITALIZATION OF ROAD CONSTRUCTION MACHINERY WORKSHOP AT NUKUM IN REPUBLIC OF YEMEN

No.	Name	Type Book/Video/ Map/Picture,etc	Original/ Copy	Issuring institution	Issued year
1	Written reply to the questionnaire from MPWH	Report	Copy	GCRB	2009
2	Written reply to the questionnaire from MPWH	Report	Copy	MPWH	2009
3	Request form from GCRB	Report	Copy	GCRB	2009
4	Master Plan for national/local road of Republic of Yemen Vol. 1	Report	Copy	MPWH (by SMEC)	2006
5	Master Plan for national/local road of Republic of Yemen Vol. 2	Report	Copy	MPWH (by SMEC)	2006
6	MPWH Annual Report /FY2008	Report	Copy	MPWH	2009
7	MPWH Annual Report /FY2009	Report	Copy	MPWH	2009
8	Workshop Annual Report /FY2004	Report	Copy	Nokumu Workshop	2005
9	Workshop Annual Report /FY2005	Report	Copy	Nokumu Workshop	2006
10	Workshop Annual Report /FY2006	Report	Copy	Nokumu Workshop	2007
11	Workshop Annual Report /FY2007	Report	Copy	Nokumu Workshop	2008
12	Workshop Annual Report /FY2008	Report	Copy	Nokumu Workshop	2009

No.	Name	Type Book/Video/Map/Picture,etc.	Original/Copy	Issuring institution	Issued year
13	Newspaper Article related to the activities of GCRB on the flood disaster occurred at Hadramawt/ north conflict area	Article	Copy	GCRB	2008
14	Order for installation of GCRB	Cabinet Order	Copy	GCRB	2008
15	RMF Annual Report /FY2008	Report	Copy	Road Maintenance Fund	2009
16	GCRB Annual Report /FY2003	Report	Copy	GCRB	2006
17	GCRB Annual Report /FY2004	Report	Copy	GCRB	2007
18	GCRB Annual Report /FY2005	Report	Copy	GCRB	2008
19	Construction Machinery Maintenance Book（Log. Book)	Booklet	Copy	Nokumu Workshop	2009