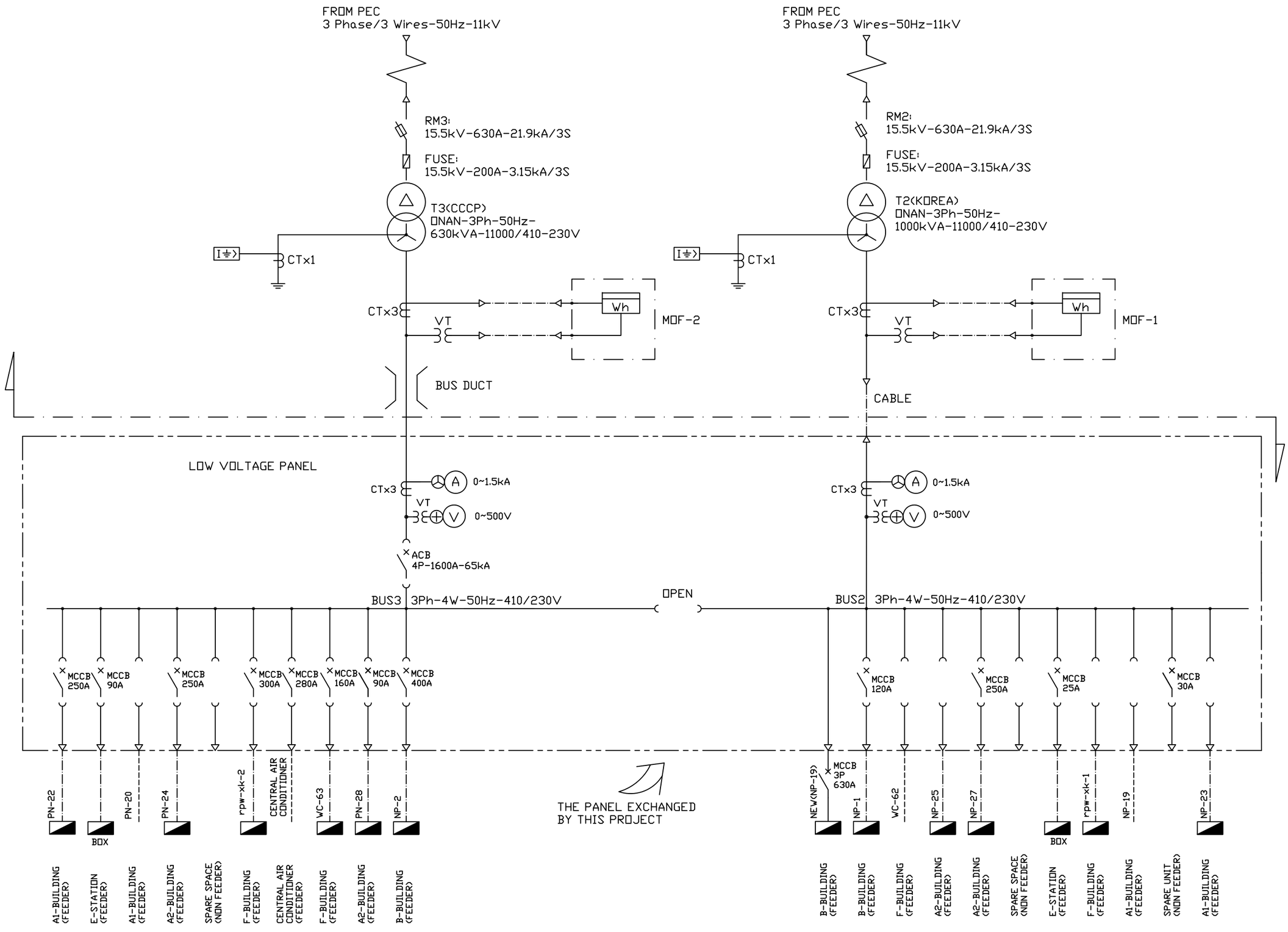
図　　面

図面リスト

Number	Title
NO. 01	SINGLE LINE DIAGRAM
NO. 02	SINGLE LINE DIAGRAM (PV SYSTEM)
NO. 03	GENERAL LAYOUT PLAN
NO. 04	BRANCH SWITCHERS FOR LOAD
NO. 05	CABLE LAYOUT PLAN
NO. 06	EQUIPMENT LAYOUT (NO. 1 ELECTRIC ROOM)
NO. 07	EQUIPMENT LAYOUT (BUILDING B ELECTRIC ROOM)



DRAWING NO. 01 SINGLE LINE DIAGRAM (AL WAHDA HOSPITAL)

TOTAL 300KW PV SYSTEM

POWER CONDITIONER CUBICLE
(ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM)

(NEW) LOW VOLTAGE PANEL(LVP) IN NO.1 ELECTRIC ROOM

SUB ARRAY 1
JUNCTION BOX NO.1

SUB ARRAY 15
JUNCTION BOX NO.15

SUB ARRAY XX
JUNCTION BOX NO.**

GRID-CONNECTION PROTECTION RELAYS
I> ID
V> V<
F> F<
RPR

RPR:REVERSE POWER RELAY

FOR BACK UP

SOLAR IRRADIATION AND THERMOMETER
TD BOX
TD
TD
DISPLAY EQUIPMNET 1
*3
*1
*2
DISPLAY EQUIPMENT 2

SYSTEM CONTROLLER
*4,*5
*6,*7

*4 TD V< Wh TD *5
*6 V< TD Wh I> TD *7

*5,*6(*7,*8:
TO SYSTEM CONTROLLER
FOR REVERSE FLOW PROTECTION CONTROL

SPARE
SPARE
DISPLAY SYSTEM 2 (*2)
DISPLAY SYSTEM 1 (*1)
TD BOX (*3)
POWER OUTLET IN CUBICLE
AIR CONDITIONER
LIGHTING IN CUBICLE

No.1,4,BOX IN ROOM
NO.2,PN-22(BUILDING A1)
NO.3,PN-20(BUILDING A1)
NO.4,PN-24(BUILDING A2)
NO.5,PN-28(BUILDING A2)
NO.6,NP-2(BUILDING B)
NO.7,WC-63(BUILDING F)
NO.8,rpw-xk-2(BUILDING F)
NO.9,SPARE
NO.10,,SPARE
NO.11,,SPARE
NO.12,,SPARE
No.20,PV SYSTEM
No.21,17,BOX IN ROOM
NO.22,PN-19(BUILDING A1)
NO.23,PN-23(BUILDING A1)
NO.24,NEW(PN-19)(BUILDING A1)
NO.25,PN-25(BUILDING A2)
NO.26,PN-27(BUILDING A2)
NO.27,NP-1(BUILDING B)
NO.28,rpw-xk-1(BUILDING F)
NO.29,,SPARE
NO.30,,SPARE
NO.31,,SPARE
NO.32,,SPARE

BRANCH SWITCHERS FOR LOAD (BSL)
IN BUILDING B

DMM

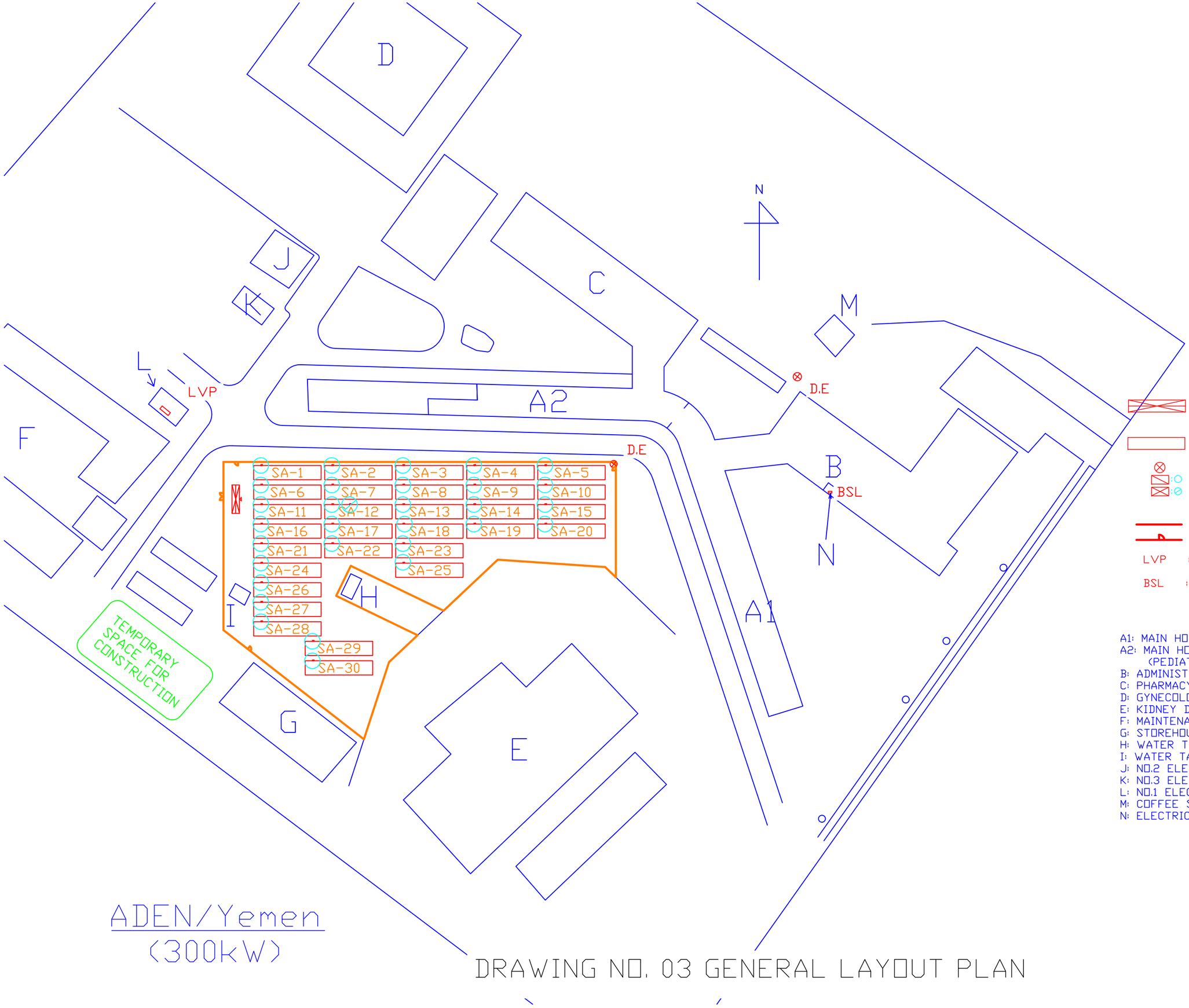
GENERAL LOAD

TOTAL 19 CIRCUITS

: SCOPE OF THE PROJECT

DMM:DIGITAL MULTI-METER
M.INT.LOCK:MECHANICAL INTERLOCK
THE CONTRACTOR SHALL CARRY OUT NECESSARY SURVEY ABOUT THE EXISTING ELECTRICAL FACILITIES.

DRAWING NO. 02 SINGLE LINE DIAGRAM (PV SYSTEM)



LEGEND

- : ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM [E.C.FOR PV]
- : PV SUB ARRAY (APPROPRIATE 10kW) [SA]
- : DISPLAY EQUIPMENT[D.E]
- : JUNCTION BOX [J.B.]
- : TRANSDUCER BOX FOR METEOROLOGICAL OBSERVATION [T.D. BOX]
- : FENCE
- : GATE

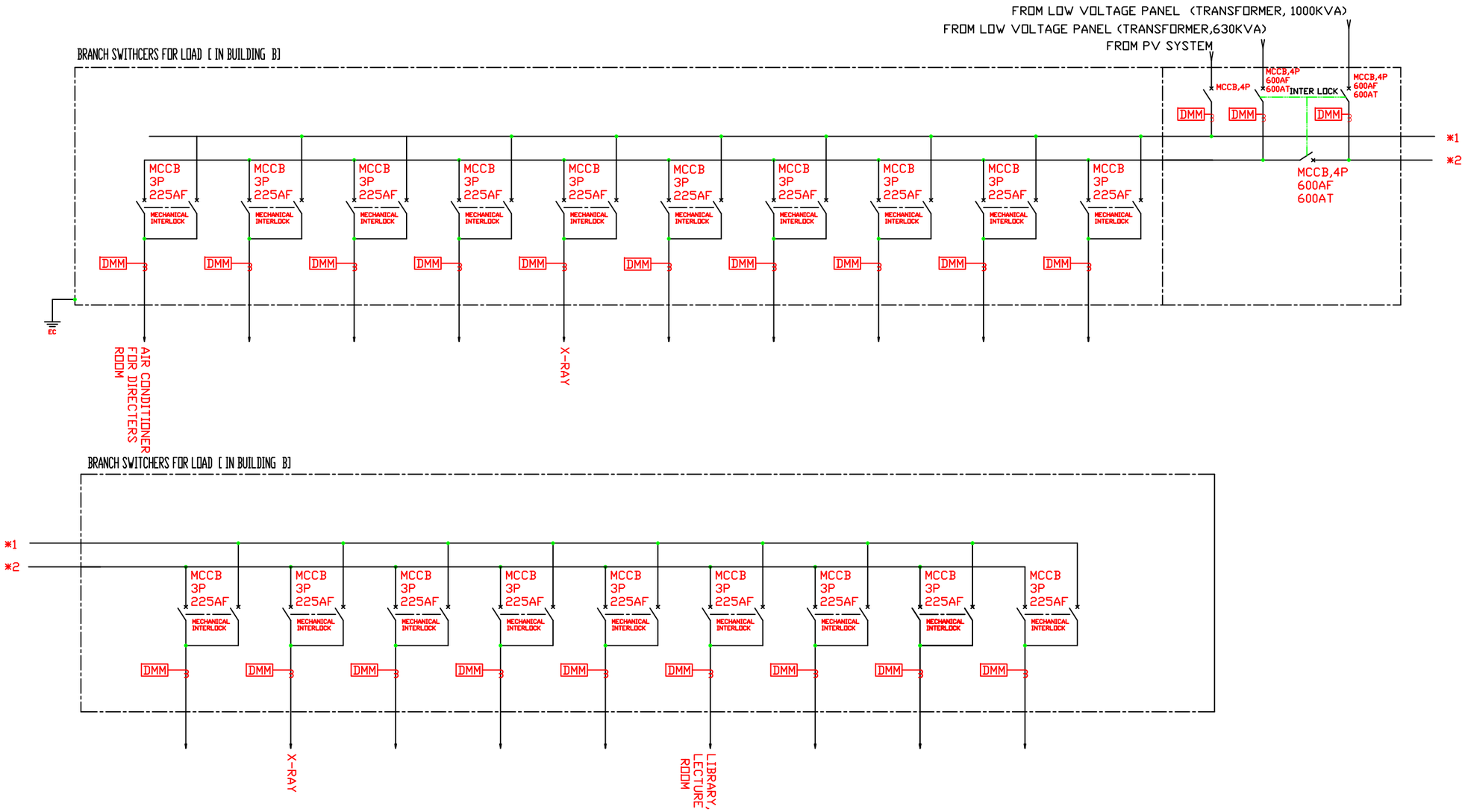
LVP : LOW VOLTAGE PANEL IN EXISTING ELECTRICAL ROOM 1
BSL : BRANCH SWITCHERS FOR LOAD IN BUILDING B

BUILDING NAME LIST

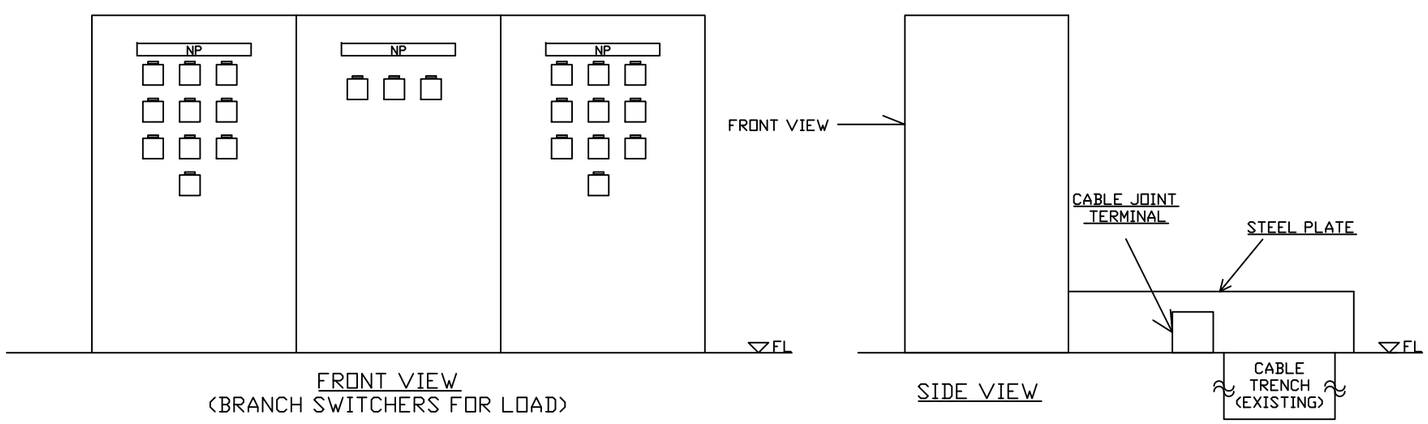
A1: MAIN HOSPITAL WARD,7F (PEDIATRIC)
A2: MAIN HOSPITAL WARD,7F (PEDIATRIC,UNDER RENOVATION)
B: ADMINISTRATION
C: PHARMACY, LABORATORY, GENERAL SERVICES
D: GYNECOLOGY,5F
E: KIDNEY DIALYTIC,2F
F: MAINTENANCE ROOM,1F
G: STOREHOUSE
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5000MM)
J: NO.2 ELECTRIC ROOM (500KW DG)
K: NO.3 ELECTRIC ROOM (NOT USE)
L: NO.1 ELECTRIC ROOM
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

ADEN/Yemen
(300kW)

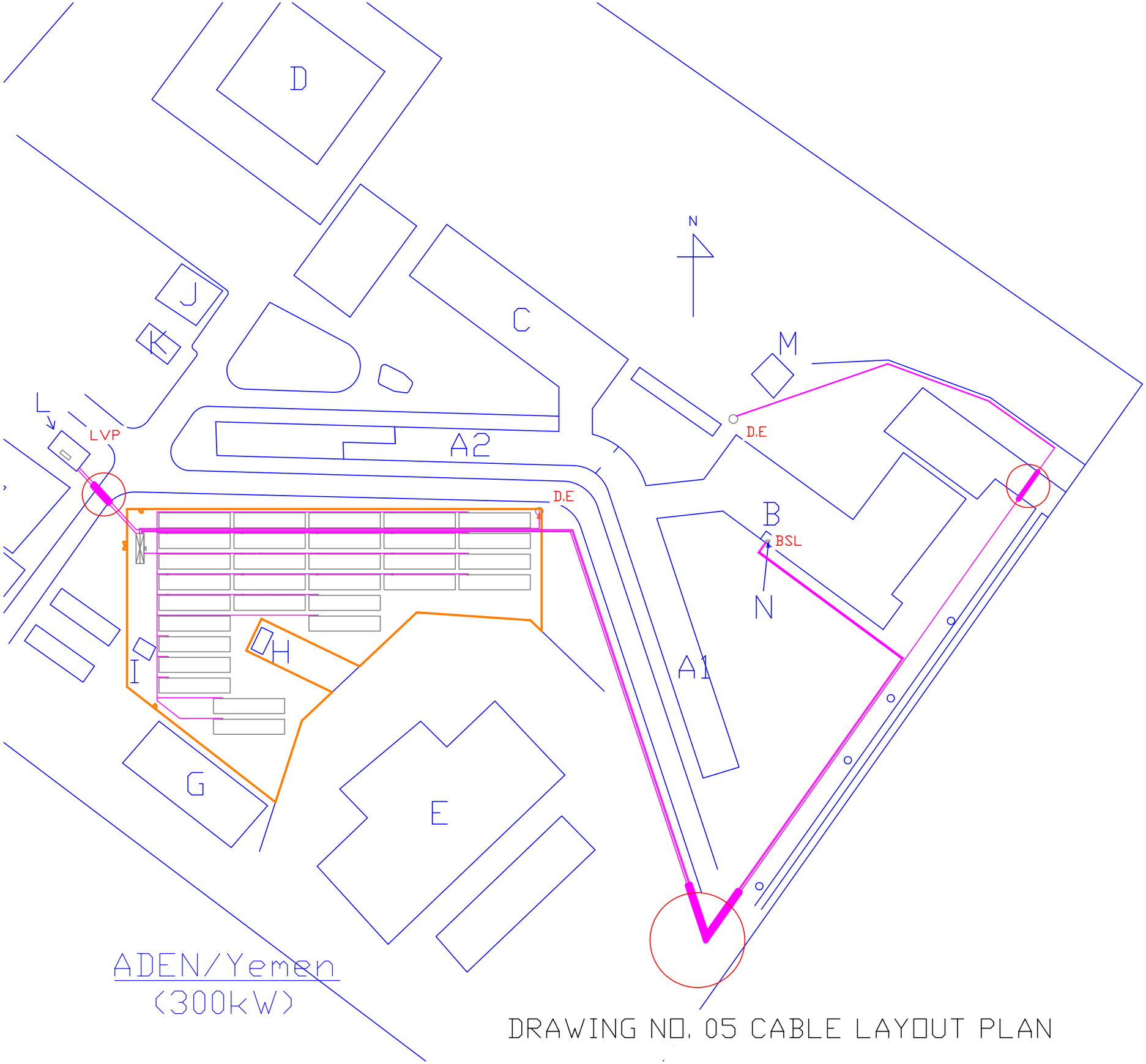
DRAWING NO. 03 GENERAL LAYOUT PLAN



DMM: DIGITAL MULTI-METER



DRAWING NO. 04 BRANCH SWITCHERS FOR LOAD



LEGEND

: ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM [E.C.FOR PV]

: PV SUB ARRAY (APPROPRIATE 10kW) [SA]

: DISPLAY EQUIPMENT[D.E]

: JUNCTION BOX [J.B.]

: TRANSDUCER BOX FOR METEOROLOGICAL OBSERVATION [T.D. BOX]

: FENCE

: GATE

LVP : LOW VOLTAGE PANEL IN EXISTING ELECTRICAL ROOM 1

BSL : BRANCH SWITCHERS FOR LOAD IN BUILDING B

BUILDING NAME LIST

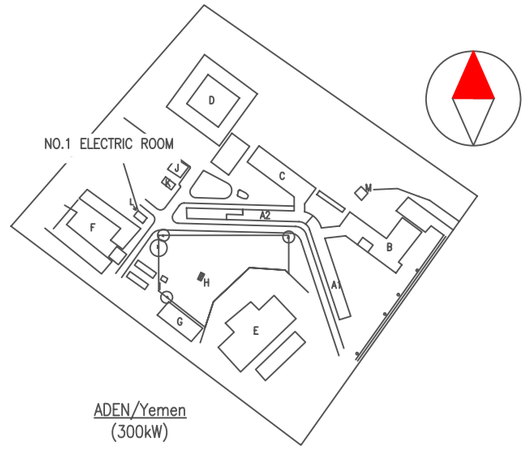
A1: MAIN HOSPITAL WARD,7F (PEDIATRIC)
A2: MAIN HOSPITAL WARD,7F (PEDIATRIC,UNDER RENOVATION)
B: ADMINISTRATION
C: PHARMACY, LABORATORY, GENERAL SERVICES
D: GYNECOLOGY,5F
E: KIDNEY DIALYTIC,2F
F: MAINTENANCE ROOM,1F
G: STOREHOUSE
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5000MM)
J: NO.2 ELECTRIC ROOM (500KW DG)
K: NO.3 ELECTRIC ROOM (NOT USE)
L: NO.1 ELECTRIC ROOM
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

NOTE:
DEPTH FROM THE GROUND SURFACE TO THE CABLE WHICH IS UNDER THE ROAD OF AL WAHDA HOSPITAL SHALL BE
> MORE THAN 1200MM (WITH FEP PIPE):
SHOWN IN BOLD LINE(ASPHALT AREA):O

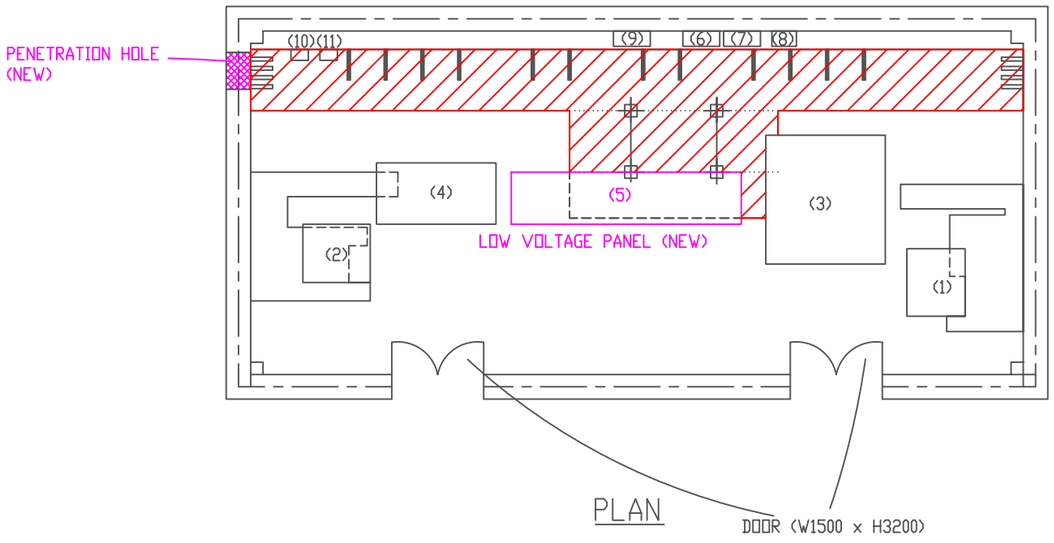
DEPTH FROM THE GROUND SURFACE TO THE CABLE SHALL BE
> MORE THAN 600MM SHOWN IN FINE LINE

ADEN/Yemen
(300kW)

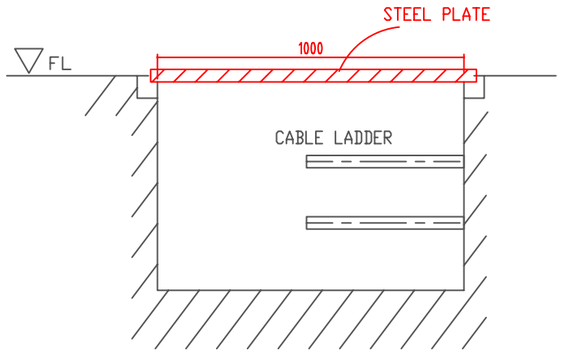
DRAWING NO. 05 CABLE LAYOUT PLAN



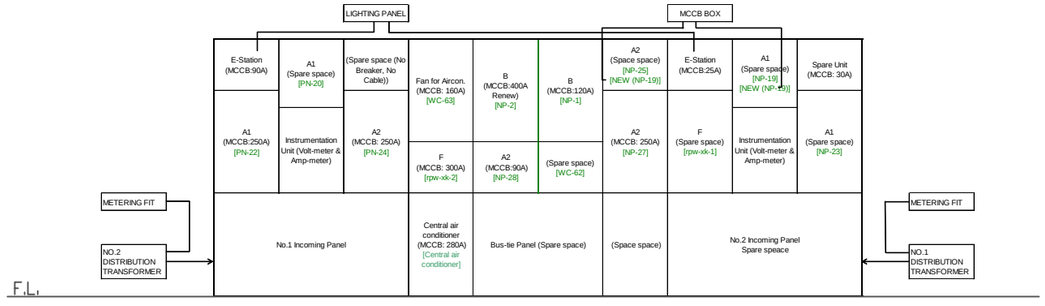
ADEN/Yemen
(300kW)



PLAN



CABLE TRENCH
(S=1/20)



FRONT VIEW
(EXISTING LOW VOLTAGE PANEL(5'))

NOTE

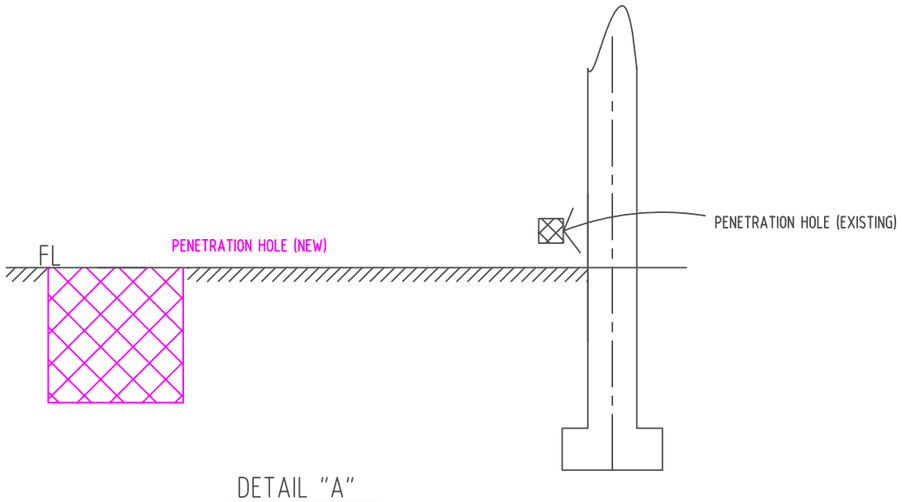
: STEEL PLATE

: PENETRATION HOLE

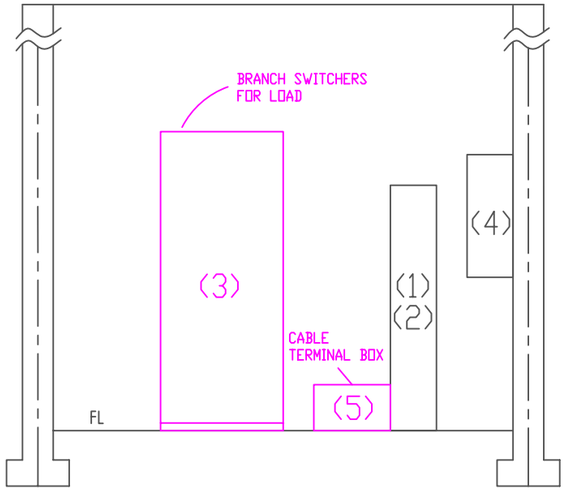
ELECTRICAL EQUIPMENT LIST

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT				REMARKS
				WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
(1)	No.1 POWER RECEIVING UNIT	11/0.5kV,METAL-ENCLOSED SWITCHGEAR (RING MAIN SWITCH TYPE), R.M SWITCH : 630A-21.9kA / 3s-50Hz, FUSE SWITCH : 200A-3.15kA / 3s (LUCY SWITCHGEAR/FARNICE)	1	1,100	950	1,550	580	EXISTING
(2)	No.2 POWER RECEIVING UNIT	11/0.5kV,METAL-ENCLOSED SWITCHGEAR (RING MAIN SWITCH TYPE), R.M SWITCH : 630A-21.9kA / 3s-50Hz, FUSE SWITCH : 200A-3.15kA / 3s (LUCY SWITCHGEAR/FARNICE)	1	1,100	950	1,550	580	EXISTING
(3)	No.1 DISTRIBUTION TRANSFORMER	ONAN TYPE, 3Ph-1,000kVA-11/0.4kV-50Hz-1.98%z-Dyn11 (MADE IN KOREA)	1	1,950	2,100	1,950	3,100	EXISTING
(4)	No.2 DISTRIBUTION TRANSFORMER	ONAN TYPE, 3Ph-630kVA-11/0.4kV-50Hz-6.15%z-Dyn11 (MADE IN CCCP)	1	1,950	1,000	1,950	3,320	EXISTING
(5)'	LOW VOLTAGE PANEL (EXISTING)	-	1	3,750	850	1,950	-	EXISTING (REPLACE)
(5)	LOW VOLTAGE PANEL	-	1	-	-	-	-	NEW
(6) (7)	METERING FIT	METAL-ENCLOSED, WALL MOUNTING TYPE INSTALLED WAT-HOUR METER	2	500	600	200	20	EXISTING
(8)	MCCB BOX	METAL-ENCLOSED, WALL MOUNTING TYPE INSTALLED MCCB	1	300	200	200	10	EXISTING
(9)	LIGHTING PANEL	METAL-ENCLOSED, WALL MOUNTING TYPE CONSISTING OF MCCB	1	400	400	200	20	EXISTING

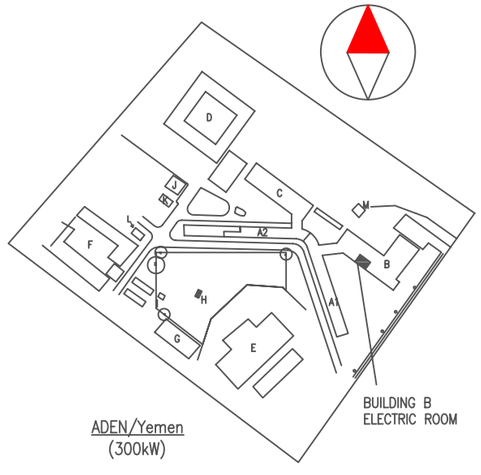
DRAWING NO. 06 EQUIPMENT LAYOUT (NO.1 ELECTRIC ROOM)



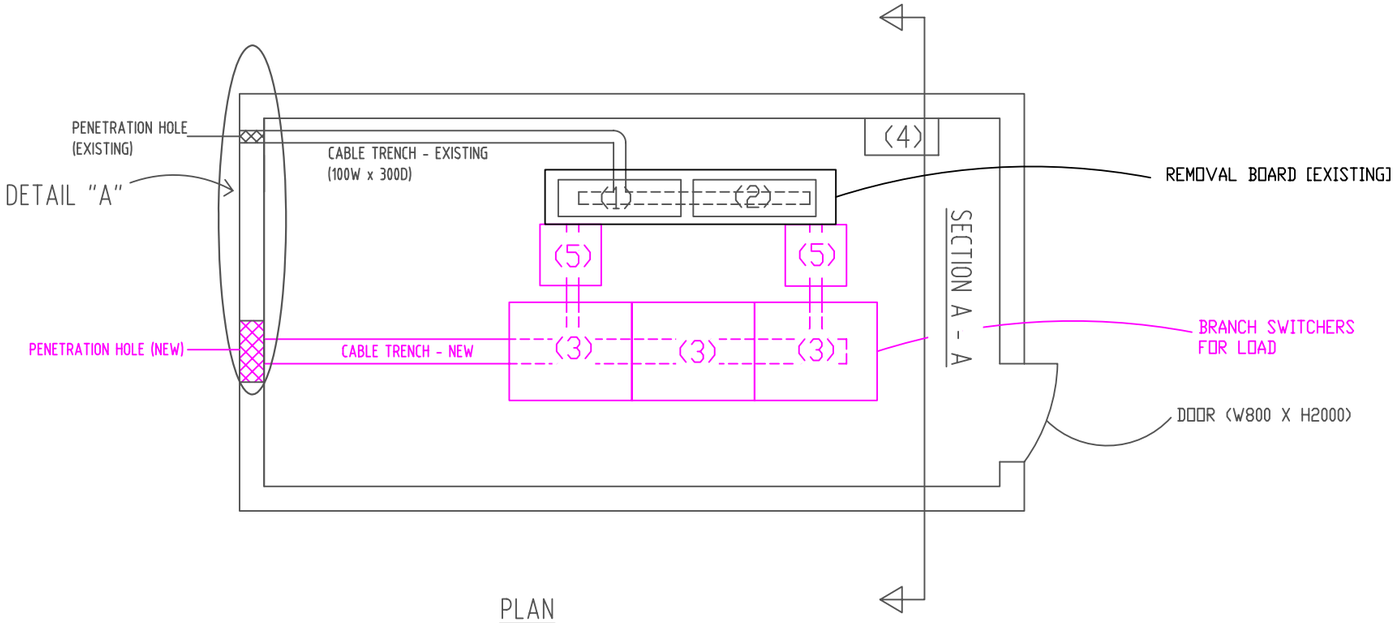
DETAIL "A"
(S=1/25)



SECTION A - A
(S=1/40)



ADEN/Yemen
(300kW)



PLAN

NOTE

: PENETRATION HOLE

ELECTRICAL EQUIPMENT LIST

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT				REMARKS
				WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
1	LOW VOLTAGE DISTRIBUTION BOARD-1	METAL-ENCLOSED, SELF-STANDING TYPE CONSISTING OF MOLDED CASE CIRCUIT BREAKER FOR FEEDER CIRCUIT.	1	1,000	300	1,600	80	EXISTING
2	LOW VOLTAGE DISTRIBUTION BOARD-2	METAL-ENCLOSED, SELF-STANDING TYPE CONSISTING OF MOLDED CASE CIRCUIT BREAKER FOR FEEDER CIRCUIT.	1	1,000	300	1,600	80	EXISTING
3	BRANCH SWITCHERS FOR LOAD	-	1	-	-	-	-	NEW
4	LIGHTING DISTRIBUTION PANEL	METAL-ENCLOSED, WALL-MOUNTING TYPE CONSISTING OF MOLDED CASE CIRCUIT BREAKER FOR FEEDER CIRCUIT.	1	600	300	800	30	EXISTING
5	CABLE TERMINAL BOX	-	1	-	-	-	-	NEW

DRAWING NO. 07 EQUIPMENT LAYOUT (BUILDING B ELECTRIC ROOM)

資　　料

1. 調査団員・氏名
2. 調査行程
3. 関係者（面会者）リスト
4. 討議議事録 (M/D)
5. ソフトコンポーネント計画書
6. 参考資料
7. その他資料・情報

1. 調査団員･氏名

調査団員氏名、所属

第 1 次現地調査

No.	氏名	担　　当	所　　属
官調査団員リスト			
1	荒木　康充	団長	JICA 資金協力支援部
2	福田　秀正	計画管理	JICA 資金協力支援部
3	東　堅治郎	調達監理計画	JICS
調査団員リスト			
4	西田　雅	業務主任／太陽光発電システム全般	㈱ニュージェック
5	八木　建一郎	系統連系太陽光発電システム	㈱ニュージェック
6	小宮　信男	機材・設備計画	㈱エー・エス・エンジニアリング
7	鶴島　哲男	調達計画／積算 1	日本テクノ㈱
8	高松　章二	制度・基準／環境社会配慮	日本テクノ㈱
10	白石　高生	系統運用	㈱ニュージェック
11	柴田　翔	業務調整	㈱ニュージェック
12	木村　友一	業務調整	㈱ニュージェック

第 2 次現地調査（詳細調査）

No.	氏名	担　　当	所　　属
調査団員リスト			
1	西田　雅	業務主任／太陽光発電システム全般	㈱ニュージェック
2	八木　建一郎	系統連系太陽光発電システム	㈱ニュージェック
3	小宮　信男	機材・設備計画	㈱エー・エス・エンジニアリング
4	有田　一博	調達計画／積算 2	日本テクノ㈱
5	高松　章二	制度・基準／環境社会配慮	日本テクノ㈱
6	白石　高生	系統運用	㈱ニュージェック
7	柴田　翔	業務調整	㈱ニュージェック

第 3 次現地調査（協力準備調査概要書の現地説明・協議）

No.	氏名	担　　当	所　　属
官調査団員リスト			
1	荒木　康充	団長	JICA 資金協力支援部
調査団員リスト			
2	西田　雅	業務主任／太陽光発電システム全般	㈱ニュージェック
3	八木　建一郎	系統連系太陽光発電システム	㈱ニュージェック
4	白石　高生	系統運用	㈱ニュージェック
5	柴田　翔	業務調整	㈱ニュージェック

2. 調査行程

第1次現地調査

	日付	曜日	官団員			コンサルタント団員							
			団長	計画管理	調達監理計画	業務主任／太陽光発電システム全般	系統連系太陽光発電システム	機材・設備計画	調達計画／積算1	制度・基準／環境社会配慮	系統運用	業務調整	業務調整
			荒木 JICA	福田 JICA	東 JICS	西田 NEWJEC	八木 NEWJEC	小宮 エーエスエンジニアリング	鶴島 日本テクノ	高松 日本テクノ	白石 NEWJEC	柴田 NEWJEC	木村 NEWJEC
1	2009/7/8	Wed											イエメン移動
2	7/9	Thu											物資調達
3	7/10	Fri	イエメン移動										ロジ手配
4	7/11	Sat	イエメン移動 表敬訪問（計画国際協力省・JICAイエメン事務所・イエメン大使館）										表敬訪問
5	7/12	Sun	ミニッツ協議（保健人口省・電力エネルギー省） サイト調査（Sabaeen病院）										
6	7/13	Mon	ミニッツ協議（JICAイエメン事務所・計画国際協力省・保健人口省・電力エネルギー省）			打合せ（PEC）	サイト調査（Al-Wahidah病院）		サイト調査（Sabaeen病院）	サイト調査（Al-Wahidah病院）	打合せ（PEC）	サイト調査（Sabaeen病院）	サイト調査（Al-Wahidah病院）
7	7/14	Tue	ミニッツ署名（JICAイエメン事務所・計画国際協力省・保健人口省・電力エネルギー省）				資料作成	サイト調査（Sabaeen病院）	資料作成	ミニッツ署名		サイト調査（Sabaeen病院）	
8	7/15	Wed	調査報告（JICAイエメン事務所・イエメン大使館）				資料作成	サイト調査（Sabaeen病院）	調査報告			サイト調査（Sabaeen病院）	
9	7/16	Thu	日本移動			団内協議・資料整理							
10	7/17	Fri	日本移動			団内協議・資料作成							
11	7/18	Sat				打合せ（GTZ, PEC）	サイト調査（Sabaeen病院）		打合せ（現地工事業者）		サイト調査（Sabaeen病院）		打合せ（GTZ, PEC）
12	7/19	Sun				打合せ（JICAイエメン事務所・MoPHP・MoPIC・MoEE）	資料作成		打合せ（現地工事業者・MoWE)		資料作成	打合せ（JICAイエメン事務所・MoPHP・MoPIC・MoEE）	打合せ（現地工事業者・MoWE)
13	7/20	Mon				サイト調査（Al-Wahidah病院）			打合せ（現地工事業者・MoWE・PEC)	打合せ（MoPHP・現地工事業者・MoWE・PEC)	サイト調査（Al-Wahidah病院）		
14	7/21	Tue				打合せ（Sabaeen病院・地方電化庁）	資料作成		打合せ（現地工事業者・MoWE)		打合せ（Sabaeen病院・地方電化庁）		資料整理
15	7/22	Wed				調査報告（JICA）							
16	7/23	Thu				エチオピア移動							日本移動

第2次現地調査（詳細設計）

	日付	曜日	コンサルタント団員					
			業務主任／太陽光発電システム全般	系統連系太陽光発電システム	機材・設備計画	調達計画／積算2	系統運用	業務調整
			西田 NEWJEC	八木 NEWJEC	小宮 エーエスエンジニアリング	有田 日本テクノ	白石 NEWJEC	柴田 NEWJEC
1	2009/10/4	Sun	イエメン移動 打合せ（JICAイエメン事務所）			イエメン移動	イエメン移動 打合せ（JICAイエメン事務所）	
2	10/5	Mon	表敬訪問（計画国際協力省・保健人口省、大使館） 団内協議			イエメン移動 団内協議	表敬訪問（計画国際協力省・保健人口省、大使館） 団内協議	ロジ手配 団内協議
3	10/6	Tue	アデン移動 表敬訪問（Al-Wahda病院） サナア移動	アデン移動 表敬訪問（Al-Wahda病院）			アデン移動 表敬訪問（Al-Wahda病院） サナア移動	アデン移動 表敬訪問（Al-Wahda病院）
4	10/7	Wed	表敬訪問（エネルギー電力省・PEC）	サイト調査（Al-Wahda病院）		現地工事業者訪問	表敬訪問（エネルギー電力省・PEC）	サイト調査（Al-Wahda病院）
5	10/8	Thu	資料作成	サイト調査（Al-Wahda病院）		現地工事業者訪問	資料作成	サイト調査（Al-Wahda病院）
6	10/9	Fri	資料作成	サイト調査（Al-Wahda病院）		資料作成	資料作成	サイト調査（Al-Wahda病院）
7	10/10	Sat	資料作成	サイト調査（Al-Wahda病院）		現地工事業者訪問	資料作成	サイト調査（Al-Wahda病院）
8	10/11	Sun	資料作成	サイト調査（Al-Wahda病院）		現地工事業者訪問	資料作成	サイト調査（Al-Wahda病院）
9	10/12	Mon	アデン移動 サイト調査（Al-Wahda病院） 団内協議	サイト調査（Al-Wahda病院） 団内協議		現地工事業者訪問 団内協議	アデン移動 サイト調査（Al-Wahda病院） 団内協議	サイト調査（Al-Wahda病院） 団内協議
10	10/13	Tue	アデン移動 サイト調査（Al-Wahda病院）	サイト調査（Al-Wahda病院）		現地工事業者訪問	サイト調査（Al-Wahda病院）	
11	10/14	Wed	資料作成・団内協議					
12	10/15	Thu	サイト調査（Al-Wahda病院） 団内協議					
13	10/16	Fri	サイト調査（Al-Wahda病院） 団内協議			サイト調査（Al-Wahda病院） 団内協議 サナア移動	サイト調査（Al-Wahda病院） 団内協議	
14	10/17	Sat	サイト調査・打合せ（Al-Wahda病院）			現地工事業者訪問	サイト調査・打合せ（Al-Wahda病院）	
15	10/18	Sun	資料作成	サイト調査・打合せ（Al-Wahda病院）		現地工事業者訪問	サイト調査（Al-Wahda病院） 打合せ（PEC・Al-Wahda病院）	
16	10/19	Mon	ミニッツ協議（Al-Wahda病院）			資料作成	ミニッツ協議（Al-Wahda病院）	
17	10/20	Tue	資料作成 サナア移動			資料作成	資料作成 サナア移動	
18	10/21	Wed	第二次調査結果報告（計画国際協力省・保健人口省・外務省・JICAイエメン事務所）	資料作成 第二次調査結果報告（JICAイエメン事務所）			第二次調査結果報告（計画国際協力省・保健人口省・外務省・JICAイエメン事務所）	精算処理 第二次調査結果報告（JICAイエメン事務所）
19	10/22	Thu	ジブチ移動					

第3次現地調査（協力準備調査概要書の現地説明・協議）

	日付	曜日	官団員	コンサルタント団員			
			団長	業務主任／太陽光発電システム全般	系統連系太陽光発電システム	系統運用	業務調整
			小林 JICA	西田 NEWJEC	八木 NEWJEC	白石 NEWJEC	柴田 NEWJEC
1	2010/4/9	Fri		イエメン移動			
2	4/10	Sat	イエメン移動	イエメン移動 表敬訪問（JICAイエメン事務所・大使館）			
3	4/11	Sun	イエメン移動 打合せ（計画国際協力省・保健人口省・電力エネルギー省）	打合せ（計画国際協力省・保健人口省・電力エネルギー省）			
4	4/12	Mon	打合せ（Al Wahda病院）				
5	4/13	Tue	ミニッツ協議（計画国際協力省）				
6	4/14	Wed	ミニッツ署名 調査報告（JICAイエメン事務所・大使館）				
7	4/15	Thu	日本移動	資料整理			
8	4/16	Fri		ジブチ移動			

3. 関係者（面会者）リスト

関係者リスト

計画国際協力省 (Ministry of Planning and International Cooperation)

Hisham Sharaf Abdalla	副大臣
Omar Abdul Aziz Abdulghani	アジア・オーストラリア二国間局長
Mohammed M. Shamsaddin	JICA 対応担当

保健人口省 (Ministry of Public Health and Population)

Ghazi Ahmed Ismail	副大臣
Nasib Mansour Maljam	サービス局長

アルワヒダ病院 (Al Wahda hospital)

Mohammed Salem Baazab	院長
Salah Salem	副院長
Marian Tahr	副院長（看護師長）
Mohamed Hakimi	副院長（技術部担当）
Hassan Mohamed	メンテナンスチーフ
Tareq Hamood	電気管理チーフ

電力エネルギー省 (Ministry of Electricity and Energy)

Ahmed Hasan Alaini	副大臣
Mohammed Hamid Al Sha’abi	再生可能エネルギー局長

地方電化再生可能エネルギー局 (Rural Electrification and Renewable Energy Development Project)

Adnan Al-Akori	再生可能エネルギー部長

PEC (Public Electricity Corporation)

Ahmed H. Addawlah	技術環境監査局長
Ahmed Ali Al-Safi	研究技術計画局長
Ali Ali Mohsen	アデン支部長
Mehdi Habtoor	技術顧問
Mohel Bamatref	技術顧問

GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit)

Sabine Schwarz	再生エネルギー顧問

水環境省 (Ministry of Water and Environment)

Mahmoud M. Shidiwah	委員長

Helal Ali Al-Riashi	環境モニタリング・調査部 次長
Salem Baquhaizel	EIA 担当部長
Ameen Mohammed Al Hmadi	計画局次長
Anwar NOAMAN	気候変動ユニット長
Ali Al-Dobhani	産業廃棄物局長

在イエメン日本大使館

敏蔭　正一	前任大使
難波　充典	大使
山口　又宏	参事官

JICA イエメン事務所

小森　毅	所長
首藤　めぐみ	企画調査員

4. 討議議事録 (M/D)

Minutes of Discussions
on the Preparatory Survey
on the Project for Clean Energy Promotion Using Solar Photovoltaic System
in the Republic of the Yemen

The Government of Japan (hereinafter referred to as "GoJ") has established Cool Earth Partnership as a new financial mechanism. Through this, GoJ is cooperating actively with developing countries' efforts to reduce greenhouse gasses emissions, such as efforts to promote clean energy. A new scheme of grant aid, "Program Grant Aid for Environment and Climate Change ", was also created by GoJ as a component of this financial mechanism. According to the initiative of Cool Earth Partnership, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with GoJ, decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Clean Energy Promotion Using Photovoltaic System in Yemen (hereinafter referred to as "the Project").

JICA sent to Yemen the Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Mr. Yasumichi ARAKI, Advisor, Grant Aid Project Management Division 1, Financing Facilitation and Procurement Supervision Department, JICA, and is scheduled to stay in the country from July 11 to 23.

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

In the course of discussions and field survey, both sides confirmed the main items described in the attached sheets.

Sana'a, July 14, 2009

Yasumichi ARAKI
Leader
Preparatory Survey Team
Japan International Cooperation Agency
JAPAN

Eng.Hisham Sharaf Abdullah
Deputy Minister for International Cooperation
Ministry of Planning and International Cooperation
YEMEN

for
Eng. Ahmed Hasan Al-Aini
Deputy Minister
Ministry of Electricity and Energy
YEMEN

Dr. Ghazi Ahmed Ismail
Deputy Minister for Curative Medicine Sector
Ministry of Public Health and Population
YEMEN

ATTACHMENT

1. Current Situation

Yemen has a chronic shortage of electricity due to lack of electricity generation capacity. The current power supply capacity in Yemen is only 900 megawatts (MW) while the demand consumption is estimated around 1,600 MW. People have been suffering from scheduled blackouts in the city area. The Yemen side has tried to increase the country's power generating capacity, expand the national power grid and introduce renewable energy systems. In the rural area, the Ministry of Electricity and Energy established the National Rural Electrification Program, which aims to introduce solar home systems for individual households out of power grid.

In this situation, both sides confirm that the Project, which introduces photovoltaic (PV) power generation systems connected with the national power grid, is one of the pilot systems to enhance the possibility of applying renewable energy.

2. Objective of the Project

The objective of the Project is to promote clean energy utilization and achieve emissions reduction by installing the PV system to be connected to the national grid.

3. Responsible Organization and Implementing Agency

3-1 The responsible organization is the Ministry of Planning and International Cooperation. The organization chart of the responsible ministry is shown in **Annex-1**.

3-2 The implementing agency is the Ministry of Public Health and Population. The organization chart of the implementing organization is shown in **Annex-2**.

3-3 The Ministry of Electricity and Energy including Public Electricity Corporation (PEC) shall be responsible for technical assistance to the Project.

4. Items Requested by the Government of Yemen

4-1 After discussions with the Team, the installation of the electric power generating system using photovoltaics including following main equipment was requested by the Yemen side.

(1) Solar module (panel)
(2) Junction Box
(3) Power Conditioner
(4) Data collecting and display device

4-2 The Yemen side requested three public hospitals, namely Sabaeen Hospital in Sana'a, Al Wahida Hospital in Aden and Al Thawra Hospital in Taiz, as candidate sites/facilities for installation of the PV system. The Team recommended the Yemen side to set up the priority order of the requested sites. However the Yemen side explained that Sabaeen Hospital in Sana'a and Al Wahida Hospital in Aden, as shown in **Annex-3**, were put on the high and same level priority due to the political and geological background, the priority was confirmed as the following table by both sides. The Yemen side understood that the Japan's Program Grant Aid for Environment and Climate Change might not be able to cover all the requested sites and

also understood the need to select the site(s) from the viewpoint of necessity, technical and financial viability, sustainability and cost-effectiveness.

City	Name of Hospital	PV Capacity	Priority
Sana'a	Sabaeen Hospital	100kW	2
Aden	Al Wahida Hospital	300kW	1

4-3 The Yemen side explained that there is no duplication between requested contents of the Project and any other plans implemented by the other donors or the Yemen side.

4-4 The Yemen side has understood that the final component and the design of the Project shall be determined at the timing of the Preparatory Survey 2 for design.

4-5 JICA will asses the appropriateness of the request and will report the findings to the GoJ.

5. Japan's Program Grant Aid for Environment and Climate Change

The Yemen side understood the Japan's Program Grant Aid for Environment and Climate Change scheme explained by the Team, as described in **Annex-4, 5, 6, 7 and 8**.

6. Schedule of the Study

6-1 The Team will proceed to further survey in Yemen until July 23 as the Preparatory Survey 1.

6-2 If the Cabinet of GoJ approves the Project based on the results of the Preparatory Survey 1, JICA will conduct the Preparatory Survey 2 for design.

7. Other Relevant Issues

7-1 Land for Installation of the PV system

Both sides confirmed that sufficient land space for installation of the PV system in Sabaeen Hospital in Sana'a and Al Wahida Hospital in Aden had been secured and available. The Team found there were a small unused building and shrubs on the candidate land for installation of solar panels in the Sabaeen Hospital. The Ministry of Public Health and Population accepted to remove those obstacles, if necessary, once the Sabeen Hospital was selected as a target site.

7-2 Procurement of Equipment

The Team explained that, in accordance with the policy of GoJ, products of Japan shall be procured for major equipment in the Project. The Yemen side agreed.

7-3 Coordination with Related Organizations

The Ministry of Public Health and Population shall be the focal point for the Project and responsible for the coordination with related organizations. The Yemen side agreed to establish a consultative committee in order to coordinate with the Japanese side which consists of the Embassy of Japan, the JICA office and the procurement agency. Terms of References of the Consultative Committee is referred to **Annex-9**.

7-4 Application of the Related Laws and Regulations

The Ministry of Electricity and Energy confirms that there is no obstacles to grant a license to the Ministry of Public Health and Population to own electric power station(s) connected to the national power grid without reverse current and use them to meet his/her own power demand at the present. It also explained that a new Electricity Law became effective on June, 2009. The Ministry of Public Health and Population shall be responsible for the application of that law and regulation through consultation with the Ministry of Electricity and Energy and other related organizations.

7-5 Operation and Maintenance

The Ministry of Public Health and Population agreed to secure and allocate the necessary budget and personnel for the operation and maintenance of the facilities procured and installed under the Project.

7-6 Customs and Tax exemption

The Yemen side shall be responsible for the exemption and/or reimbursement (payment/assumption) of all customs, tax, levies and duties incurred in Yemen for implementation of the Project.

7-7 The Yemen side shall ensure the security of all concerned Japanese nationals working for the Project, if deemed necessary.

7-8 The Yemen side shall provide necessary numbers of counterpart personnel to the Team during the period of their studies in Yemen.

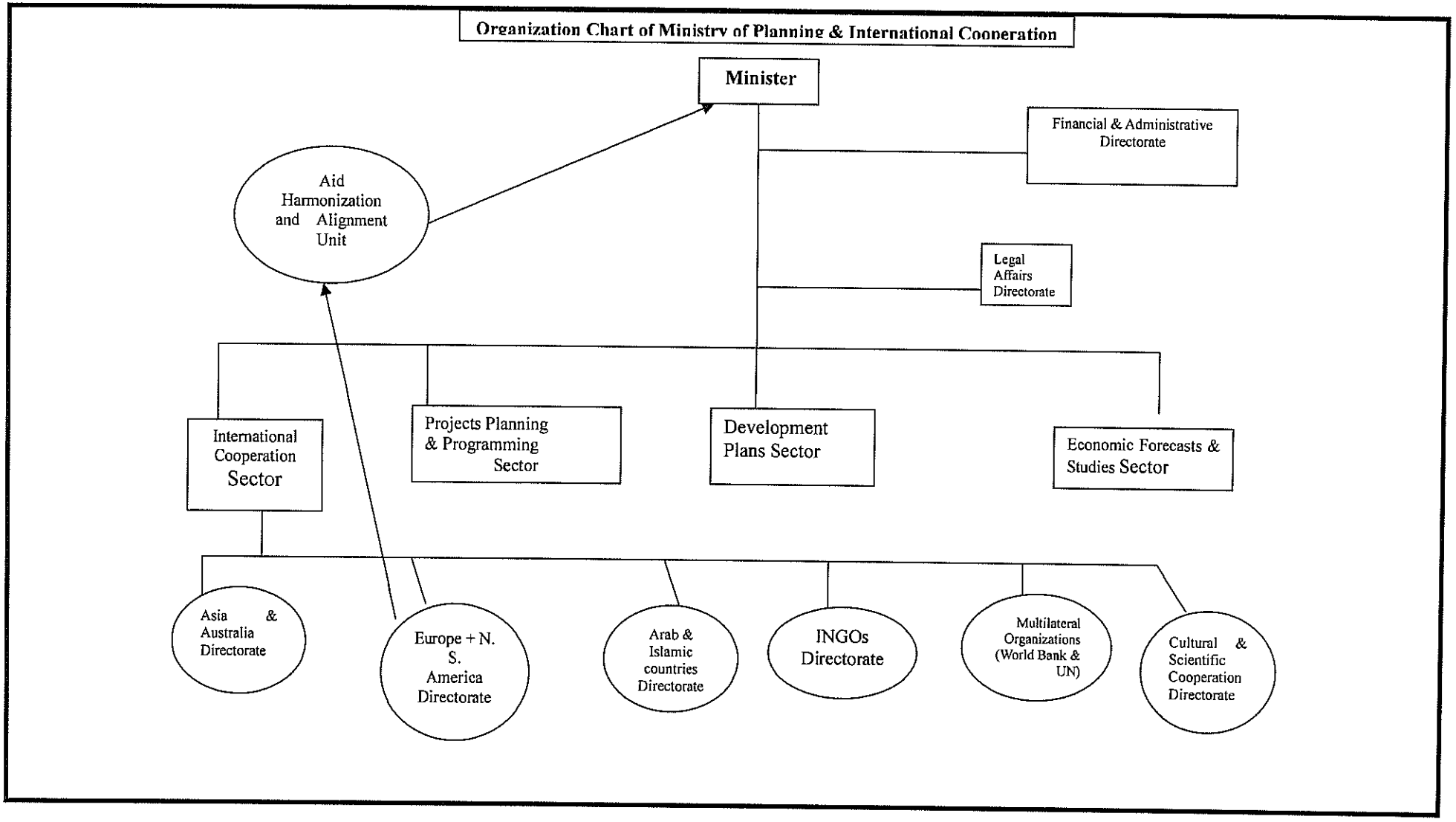
7-9 The Yemen side shall submit all the answers to the Questionnaire, which the Team handed to the Yemen side, by July 22, 2009.

<List of Annex>

Annex-1 Organization Chart of Ministry of Planning and International Cooperation
Annex-2 Organization Chart of Ministry of Public Health and Population
Annex-3 Candidate site of the Project
Annex-4 Program Grant Aid for Environment and Climate Change
Annex-5 General Flow of Program Grant Aid for Environment and Climate Change
Annex-6 Flow of Funds for Project Implementation
Annex-7 Project Implementation System
Annex-8 Major Undertakings to be taken by Each Government
Annex-9 Terms of References of the Consultative Committee

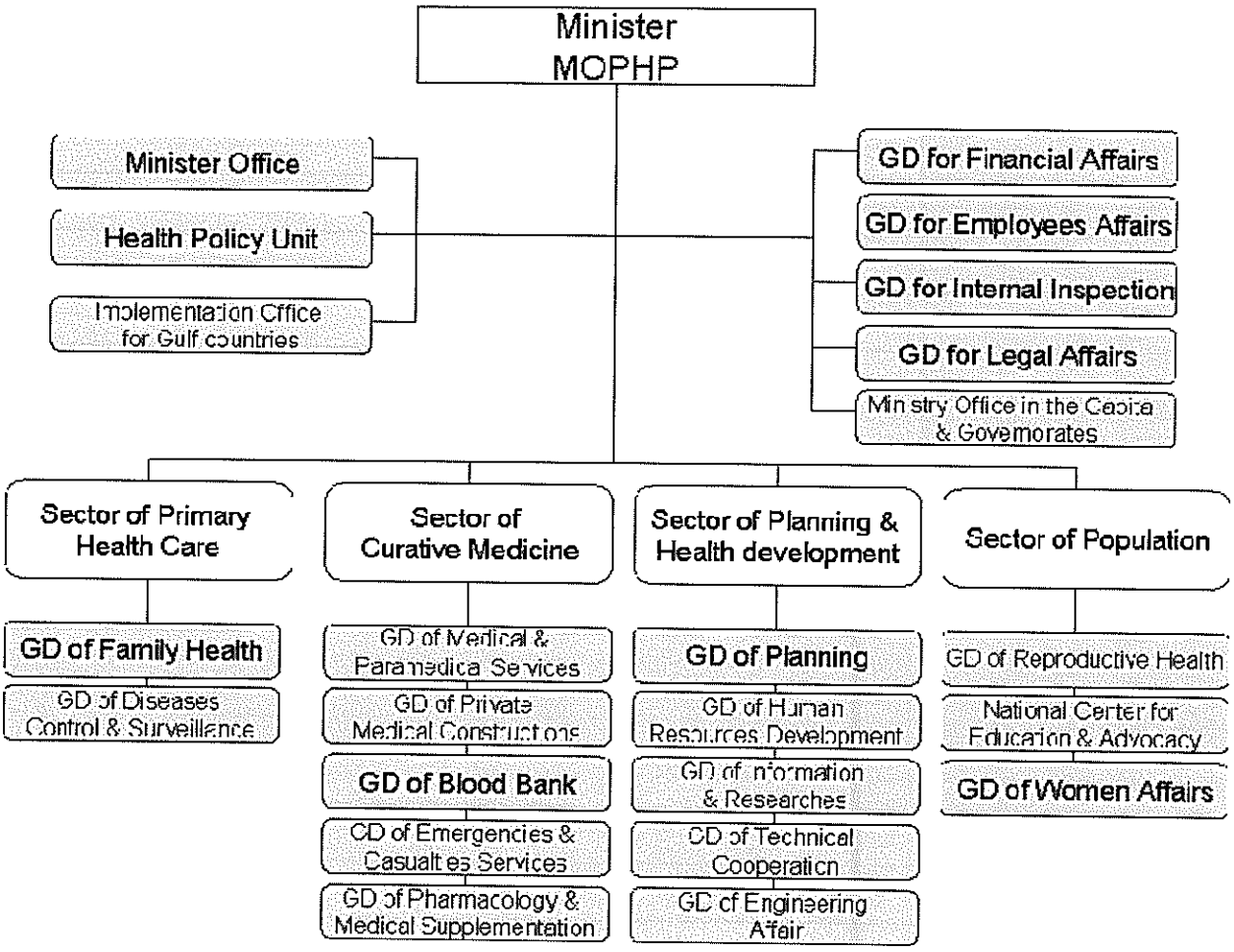
Annex-1

Organization Chart of Ministry of Planning and International Cooperation



Annex-2

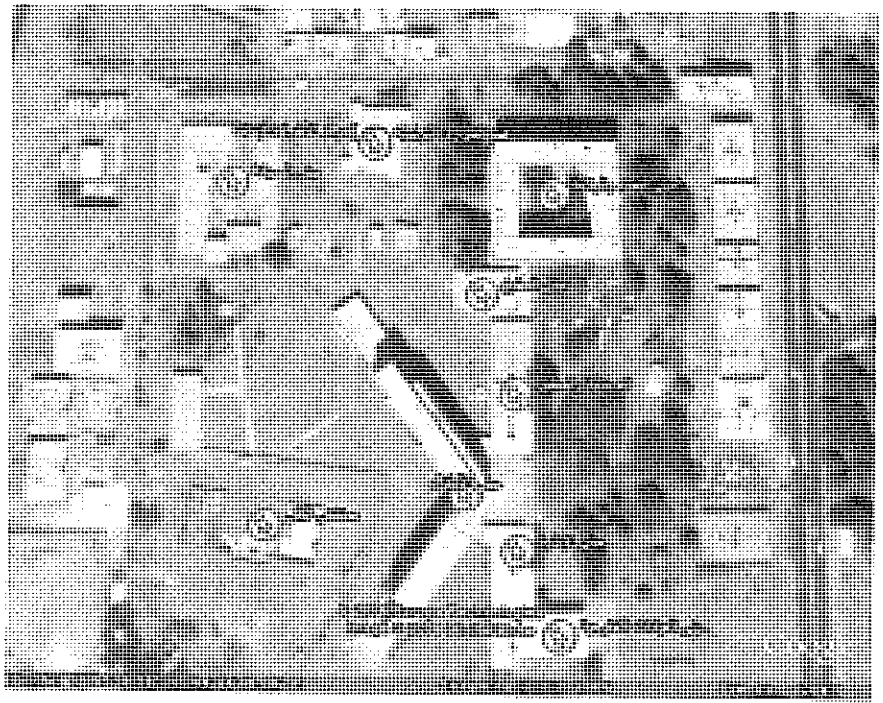
Organization Chart of Ministry of Public Health and Population



Candidate site of the Project

1. Sana'a: Al Sabeen Hospital for Motherhood & Childhood
Location: Al Sabeen Square, Capital Secretariat of Sana'a

2. Aden: Al Wahidah Hospital Aden
Location: Al Sheikh Otham District, Aden City



Annex-4

Program Grant Aid for Environment and Climate Change of the Government of Japan
(Provisional)

The Grant Aid provides a recipient country (hereafter referred to as "the Recipient") with non-reimbursable funds to procure the facilities, equipment, and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

Based on "Cool Earth Partnership" initiative of the Government of Japan, the Program Grant Aid for Environment and Climate Change (hereafter referred to as "GAEC") aims to mitigate effects of global warming by reducing GHGs emission (mitigation; e.g. improvement of energy efficiency) and to take adaptive measures (adaptation; e.g. measures against disasters related to climate change, including disaster prevention such as enhancing disaster risk management).GAEC may contain multiple components that can be combined to effectively meet these needs.

1. Procedures for GAEC

GAEC is executed through the following procedures.

Preparatory Survey 1	Preparatory Survey for projectz identification conducted by Japan International Cooperation Agency (JICA)
Application	Request made by a recipient country
Appraisal & Approval	Appraisal by the Government of Japan and Approval by the Cabinet
Determination of Implementation	The Notes exchanged between the Government of Japan and the Recipient Country
Grant Agreement (hereinafter reffered to as the "G/A")	Agreement concluded between JICA and the Recipient
Preparatory Survey 2	Preparatory Survey for design conducted by JICA
Implementation	Procurement through the Procurement Agency by the Recipient

Firstly, if the candidate project for a GAEC is identified by the Recipient and the Government of Japan, the Government of Japan (the Ministry of Foreign Affairs) examines it whether it is eligible for GAEC. When the request is deemed appropriate, JICA, in consultation with the Government of Japan, conducts the Preparatory Survey (hereafter referred to as "the Survey") on the candidate project as Phase 1 of the Survey with Japanese consulting firms.

Secondly, the Recipient submits the official request to the Government of Japan, while the appropriateness, necessity and the basic components of the project are examined in the course of Phase 1 of the Survey,

Thirdly, the Government of Japan appraises the project to see whether it is suitable for Japan's GAEC, based on the Survey report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Governments of Japan and the Recipient.

Fifthly, JICA engages Grant Agreement (G/A) with the Recipient and executes the Grant by making payments of the amount agreed in the E/N and strictly monitors that the funds of the Grant are properly and effectively used.

Procurement Management Agent is designated to conduct the procurement services of products and services (including fund management, preparing tenders, contracts) for GAEC on behalf of the Recipient. The Agent is an impartial and specialized organization that will render services according to the Agent Agreement with the Recipient. The Agent is recommended to the Recipient by the Government of Japan and agreed between the two Governments in the Agreed Minutes ("A/M").

2 Preparatory Survey

1) Contents of the Survey

The purpose of the Preparatory Survey (hereafter referred to as "the Survey"), conducted by JICA on a requested project (hereafter referred to as "the Project"), is to provide the basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Survey are as follows:

- Confirmation of background, objectives, and benefits of the Project and institutional capacity of agencies and communities concerned of the Recipient necessary for project implementation.
- Evaluation of relevance of the Project to be implemented under the Grant Aid Scheme for Environment and Climate Change from a technical, social, and economic point of view.
- Confirmation of items agreed upon by both parties concerning the basic concept of the Project.
- Preparation of the design of the Project and reference document for tender.
- Estimation of cost for the Project.

The contents of the original request will be modified, as found necessary, in the design of the Project according to the guidelines of Japan's Grant Aid scheme.

The Government of Japan requests the Government of the Recipient to take whatever measures necessary to ensure its responsibility in implementing the Project. Such measures must be guaranteed even if they may fall outside the jurisdiction of the implementing organization of the Recipient. This has been confirmed by all relevant organizations of the Recipient through the Minutes of Discussions.

2) Selection of consulting firms

For the smooth implementation of the Survey, JICA will conduct the Survey with registered consulting firms. JICA selects the firms based on proposals submitted by firms with interest in implementing the Survey. The firms selected will carry out the Preparatory Survey and prepare a report, based on the terms of reference set by JICA.

3. Implementation of GAEC after the E/N

1) Exchange of Notes (E/N)

The content of GAEC will be determined in accordance with the Notes exchanged by the two

Governments concerned, in which items including, objectives of the project, period of execution, conditions and amount of the Grant Aid are confirmed.

2) Details of Procedures

Details of procedures on procurement and services under GAEC will be agreed between the authorities of the two governments concerned at the time of the signing of the G/A.

Essential points to be agreed are outlined as follows:

a) JICA will supervise the implementation of the Project.
b) Products and services will be procured and provided in accordance with JICA's "Procurement Guidelines for the Program Grant Aid for Environment and Climate Change."
c) The Recipient will conclude a contract with the Agent.
d) The Agent is the representative acting in the name of the Recipient concerning all transfers of funds to the Agent.

3) Focal points of "Procurement Guidelines for the Program Grant Aid for Environment and Climate Change"

a) The Agent

The Agent is the organization, which provides procurement of products and services on behalf of the Recipient according to the Agent Agreement with the Recipient. The Agent is recommended to the Recipient by the Government of Japan and agreed between the two Governments in the A/M.

b) Agent Agreement

The Recipient will conclude the Agent Agreement, in principle, within two months after the signing of the G/A, in accordance with the A/M. The scope of the Agent's services will be clearly specified in the Agent Agreement.

c) Approval of the Agent Agreement

The Agent Agreement is prepared as two identical documents and the copy of the Agent Agreement will be submitted to JICA by the Recipient through the Agent. JICA confirms whether the Agent Agreement is concluded in conformity with the E/N, A/M, and G/A and the Procurement Guidelines for the Program Grant Aid for Environment and Climate Change then approves the Agent Agreement.

The Agent Agreement concluded between the Recipient and the Agent will become effective after the approval by JICA in a written form.

d) Payment Methods

The Agent Agreement will stipulate that "Regarding all transfers of the fund to the Agent, the Recipient will designate the Agent to act on behalf of the Recipient and issue a Blanket Disbursement Authorization ("the BDA")to conduct the transfer of the fund (hereinafter referred to as "the Advances") to the Procurement Account from the Recipient Account.

The Agent Agreement will clearly state that the payment to the Agent will be made in Japanese yen from the Advances and that the final payment to the Agent will be made when the total remaining amount become less than three percent (3%) of the Grant and its accrued interests excluding the Agent's fees.

e) Products and Services Eligible for Procurement

Products and services to be procured will be selected from those defined in the G/A.

f) Selection of firms

In principle, firms of any nationality could be contracted as long as the firms satisfy the conditions specified in the tender documents.

The same applies for any individual consultants who will be involved in the Project and provide services necessary for the training and guidance related to the Project.

The consultants that will be employed to do detail design and supervise the work for the Project, however will be in principle, Japanese nationals recommended by JICA for the purpose of maintaining technical consistency with the Study.

g) Method of Procurement
When conducting the procurement, sufficient attention will be paid to transparency in selecting the firms and for this purpose, competitive tendering will be employed in principle.

h) Tender Documents
The tender documents should contain all information necessary to enable tenderers to prepare valid offers for the products and services to be procured by GAEC.

The rights and obligations of the Recipient, the Agent and the firms supplying products and services should be stipulated in the tender documents to be prepared by the Agent. Aside from this, the tender documents will be prepared in consultation with the Recipient.

i) Pre-qualification Examination of Tenderers
The Agent may conduct a pre-qualification examination of tenderers in advance of the tender so that the invitation to the tender can be extended only to eligible firms. The pre-qualification examination should be performed only with respect to whether the prospective tenderers have the capability of concluding the contracts.

For this, the following points should be taken into consideration:
(1) Experience and past performance in contracts of similar kind
(2) Financial credibility (including assets such as real estate)
(3) Existence of offices and other items to be specified in the tender documents.
(4) Their potentialities to use necessary personnel and facilities.

j) Tender Evaluation
The tender evaluation should be implemented on the basis of the conditions specified in the tender documents.

Those tenderers which substantially conform to the technical specifications and other stipulations of the tender documents, will be judged in principle on the basis of the submitted price, and the tenderer who offers the lowest price will be designated as the successful tenderer.

The Agent will submit a detailed evaluation report of tenders to JICA for its information, while the notification of the results to the tenderers will not be premised on the confirmation by JICA.

k) Additional procurement
If there is any remaining balance after the competitive and/or selective tendering and/or direct negotiation for a contract, and if the Recipient would like to procure additional items, the Agent is allowed to conduct this additional procurement, following the points mentioned below:
(1) Procurement of same products and services

When the products and services to be additionally procured are identical with the initial tender and a competitive tendering is judged not efficient, additional procurement can be conducted by a negotiated contract with the successful tenderer of the initial tender.

(2) Other procurements

When products and services other than those mentioned above in (1) are to be procured, the procurement should be conducted through competitive tendering. In this case, the products and services for additional procurement will be selected from among those in accordance with the G/A.

l) Conclusion of the Contracts

In order to procure products and services in accordance with the guideline, the Agent will conclude contracts with firms selected by tendering or other methods.

m) Terms of Payment

The contract will clearly state the terms of payment. The Agent will make payment from the "advances," against the submission of the necessary documents from the firm on the basis of the conditions specified in the contract. When the services are the object of procurement, the Agent may pay certain portion of the contract amount in advance to the firms on the conditions that such firms submit the advance payment guarantee worth the amount of the advance payment to the Agent.

4) Undertakings required by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the Recipient is required to undertake necessary measures as the following:

a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the Project.
b) To provide facilities for distributing electricity, water supply and drainage and other incidental facilities in and around the sites.
c) To ensure all the expense and prompt execution for unloading, customs clearing at the port of disembarkation and domestic transportation of products purchased under the Grant Aid,
d) To ensure that customs duty, internal taxes and other fiscal levies that may be imposed in the Recipient with respect to the purchase of the Components and the Agent's services will be exempted by the Government of the Recipient.
e) To accord all the concerned parties, whose services may be required in connection with supply of the products and services under the contracts, such facilities as may be necessary for their entry into the Recipient and stay therein for the performance of their work.

5) "Proper use of funds"

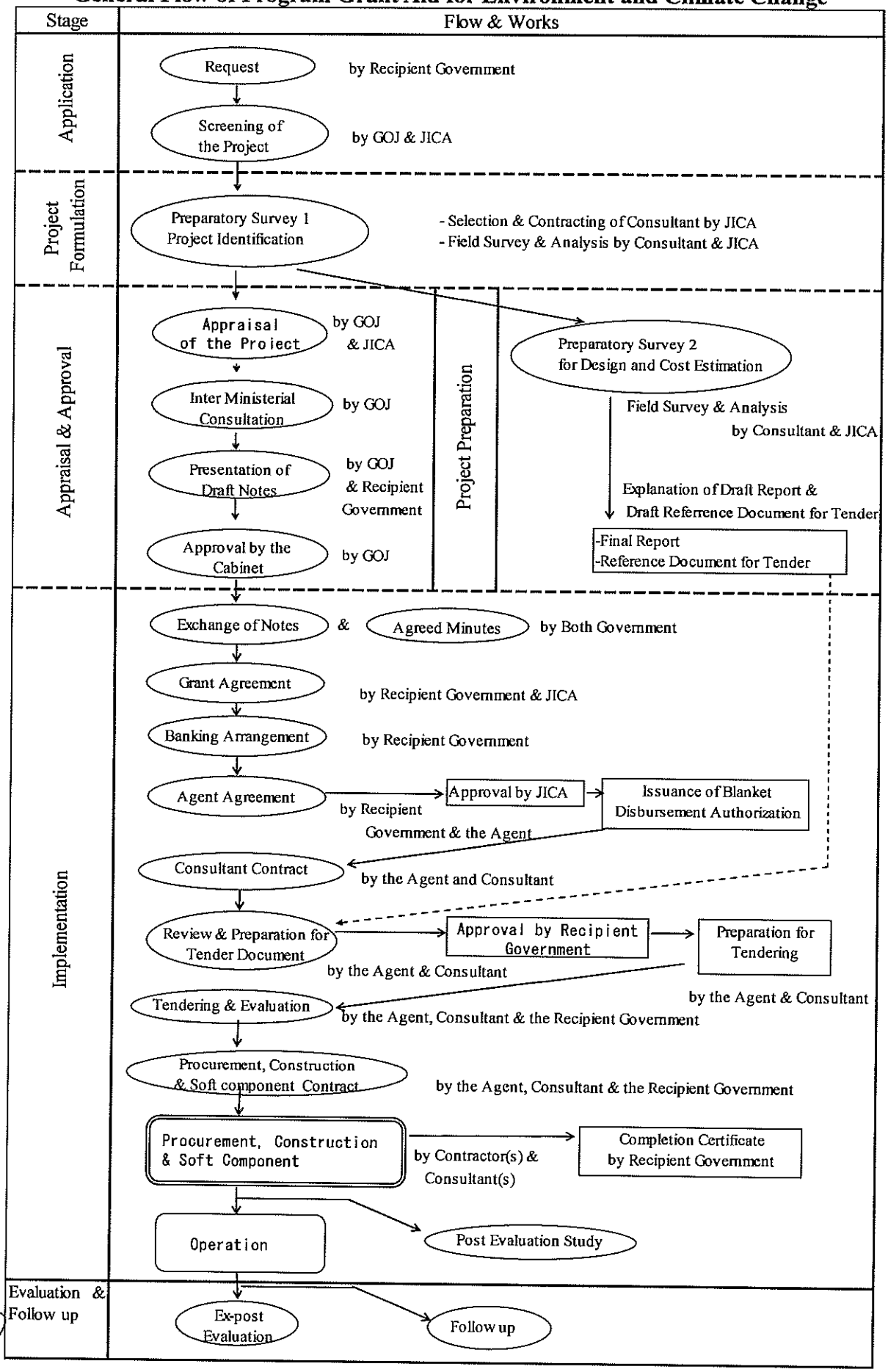
The Recipient is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign personnel necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

6) "Export and Re-export" of products

The products purchased under the Grant and its accrued interest will not be exported or re-exported from the Recipient.

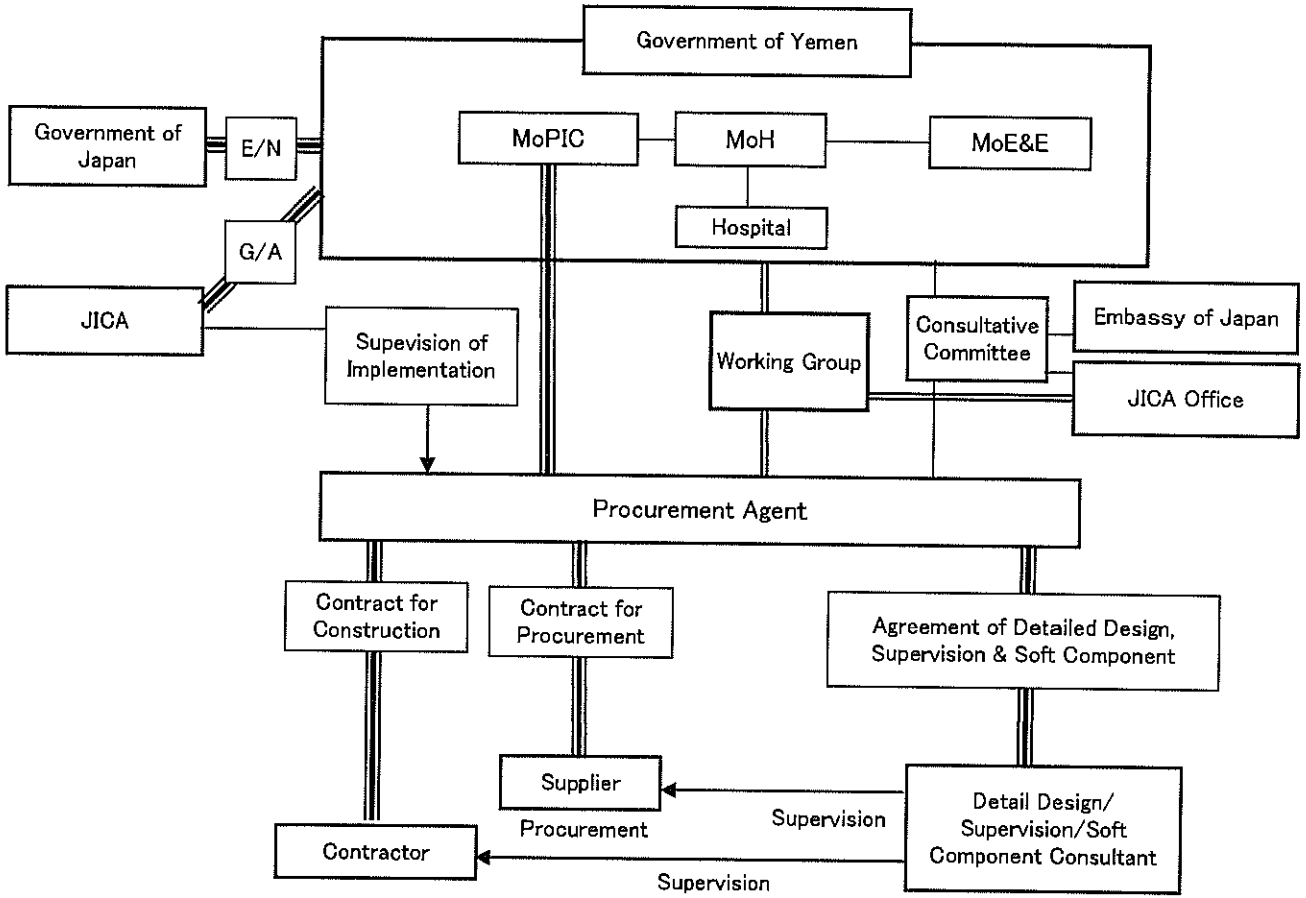
Annex-5

General Flow of Program Grant Aid for Environment and Climate Change



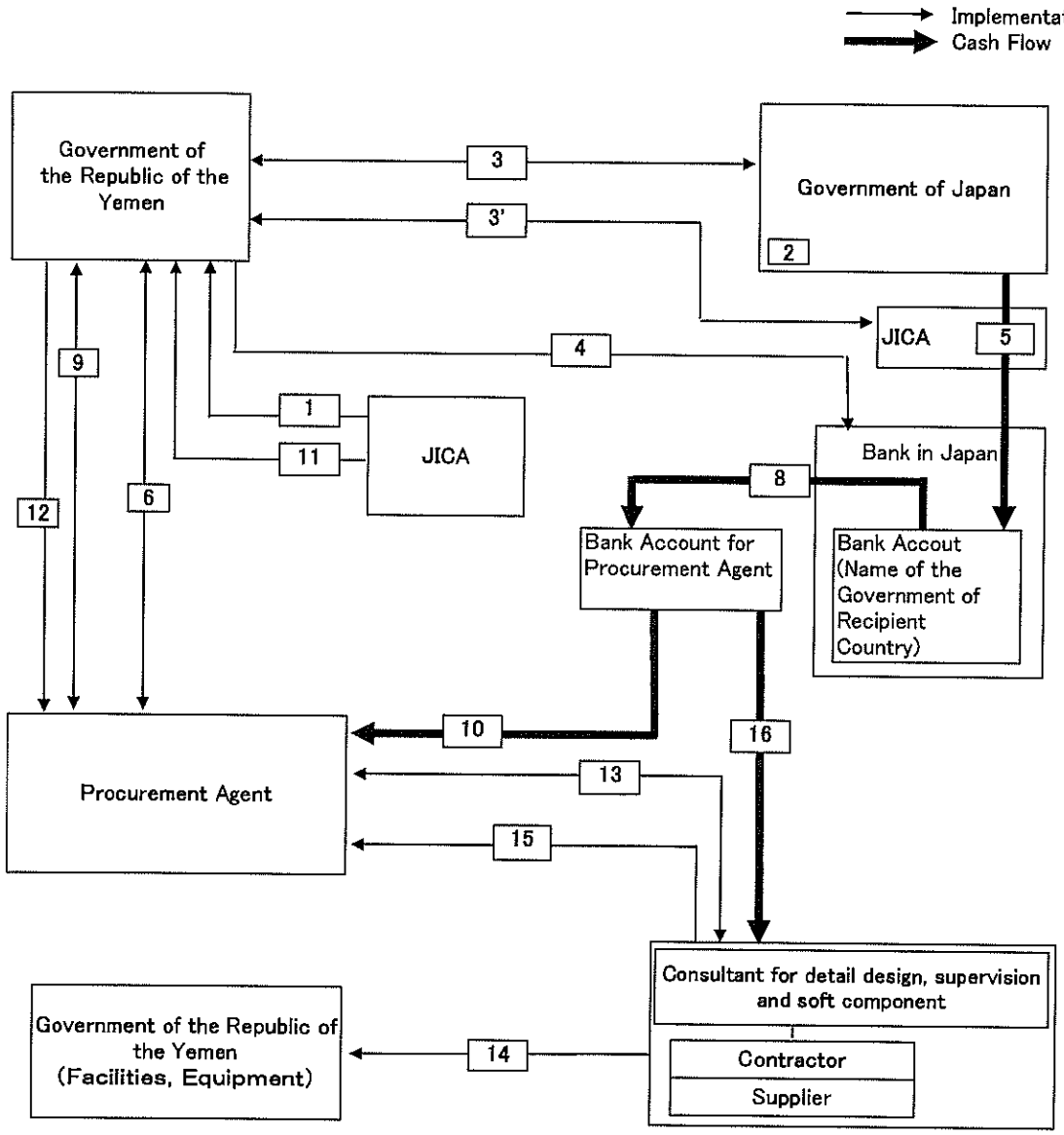
Annex-6

Project Implementation System



Annex-7

Flow of Funds for Project Implementation



1 Preparatory Survey / Reference Document for Tender

2 Approval of Cabinet

3 Signing of Exchange of Notes (E/N)

3' Signing of Grant Agreement (G/A)

4 Banking Arrangement (B/A)

5 Disbursement of Funds from the Government of Japan

6 Signing of Agent Agreement (A/A) +BDA

7 N/A

8 Transfer of Funds

9 Decision of Project Components

10 Payment of Remuneration for Agent

11 Recommendation of Consultant for Detail Design/Supervision (JICA→Government of the Republic of the Yemen)

12 Recommendation of Consultant for Detail Design / Supervision (Government of the Republic of the Yemen→Procurement

13 Conclusion of Contract

14 Construction and Procurement

15 Application for Payment

16 Payment

Annex-8

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 land		●
2	To clear, level and reclaim the site when needed urgently		●
3	To construct gates and fences in and around the site		●
4	To construct a parking lot if necessary		●
5	To construct roads		
	1) Within the site	●	
	2) Outside the site and Access road		●
6	To construct the facility and install the equipment	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities if necessary:		
	1)Electricity		
	a. The power distribution line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer for the site	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for conveying storm water, sewage, etc. from the site)		●
	b. The drainage system within the site (for sewage, ordinary waste, storm water, etc.)	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions applied by the bank in Japan for banking services based upon the Bank Arrangement (B/A):		
	1) Payment of bank commission		●
9	To ensure all the expense and prompt execution of unloading and customs clearance at the port of disembarkation in the recipient country		
	1) Marine or air transportation of the products from Japan or third countries to the recipient	●	
	2) To ensure all the expense and prompt execution of unloading, tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
10	To accord Japanese nationals and / or nationals of third countries, including persons employed by the agent whose services may be required in connection with the Components such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		●
11	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent will be exempted by the Government of recipient country		●
12	To maintain and use properly and effectively the facilities that are constructed and the equipment that is provided under the Grant.		●
13	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the purchase of the Components as well as for the agent's fees.		●
14	To ensure environmental and social consideration for the Programme.		●

Annex- 9

Terms of Reference of the Consultative Committee

1. To confirm an implementation schedule of the Programme for the speedy and effective utilization of the Grant and its accrued interest.

2. To discuss the modifications of the Programme, including modification of the design of the facility.

3. To exchange views on allocations of the Grant and its accrued interest as well as on potential end-users.

4. To identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems.

5. To exchange views on publicity related to the utilization of the Grant and its accrued interest.

6. To discuss any other matters that may arise from or in connection with the G/A.

Minutes of Discussions
on the Preparatory Survey
on the Project for Introduction of Clean Energy by Solar Electricity Generation System
in the Republic of Yemen
(Explanation on Draft Final Report)

In July and October 2009, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Clean Energy Promotion Using Solar Photovoltaic System (hereinafter referred to as "the Project") in the Republic of Yemen (hereinafter referred to as "Yemen"), and through discussions, field survey and technical examination of the results of the survey in Japan, JICA prepared a Draft Final Report of the Outline Design.

In order to explain and to consult with the concerned officials of the Government of Yemen on the component of the Draft Final Report, JICA sent Yemen the Preparatory Survey Team for Draft Final Report Explanation (hereinafter referred to as "the Team"), which is headed by Mr. Yasumichi ARAKI, Advisor, Grant Aid Project Management Division 1, Financing Facilitation and Procurement Supervision Department, JICA, from April 10 to 16, 2010.

As a result of discussion, both sides confirmed the main items described on the attached sheets.

Sana'a, April 14, 2010

Yasumichi ARAKI
Leader
Preparatory Survey Team
Japan International Cooperation Agency
JAPAN

Eng. Hisham Sharaf Abdullah
Vice Minister
Ministry of Planning and International Cooperation
YEMEN

Eng. Ahmed Hasan Al-Aini
Deputy Minister
Ministry of Electricity and Energy
YEMEN

Dr. Ghazi Ahmed Ismail
Deputy Minister for Curative Medicine Sector
Ministry of Public Health and Population
YEMEN

ATTACHMENT

1. Components of the Draft Final Report

The Yemen side agreed and accepted in principle the components of the Draft Final Report explained by the Team.

2. Program Grant Aid for Environment and Climate Change of the Government of Japan

Both sides reconfirmed to take necessary measures based on the previous Minutes of Discussion signed by both sides on July 14, 2009 (hereinafter referred to as "the previous M/D") in accordance with following procedures of the Program Grant Aid for Environment and Climate Change of the Government of Japan.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Ministry of Public Health and Population and carbon copy to the Ministry of Planning and International Cooperation by August 2010.

4. Confirmation of progress made for the previous M/D

4.1. Project site and capacity of PV module

Both sides confirmed that the project site was Al Wahda Hospital shown in **Annex-1** and the capacity of Photovoltaic (PV) module designed in the Project was 300kW based on the result of outline design and cost estimation.

4.2. Application of the Related Laws and Regulations

In the previous M/D, it was stated that the Ministry of Public Health and Population shall be responsible for the application, concerning a license for the installation of PV power station connected to the national power grid in the Project, to be submitted to the Ministry of Electricity and Energy. The Yemen side explained that the connection between PV power station installed in the Project and the national power grid was basically agreed by concerned ministries and organizations, and Al Wahda Hospital should submit necessary application forms for the connection to the Public Electricity Corporation at Aden.

5. Items of Equipment to be procured

The Team explained that the items of equipment to be procured as shown in **Annex-2** based on the result of the Preparatory Survey conducted in October 2009. After discussion, both sides confirmed that the major equipment such as PV modules (PV cells) and Power Conditioners should be products of Japan, and products of third country could be acceptable for other equipment as a part of components.

6. Soft Component

The Team explained that the following items were included in the soft component which meant

trainings for the operation and maintenance of equipment and PV system in the Project.

- Lectures on Basic knowledge
- Exercises on Construction Planning
- Exercise on Method of Operation and Maintenance
- On the Job Training (witnessing Tests and Inspections)
- Operation and Maintenance Management Planning
- Organization for better management
- Preparation of materials for public awareness of clean energy
- Workshop

7. Design of PV System (Function for Stand-Alone Operation)

Both sides shared the understanding on the necessity of stand-alone operation function during the electric blackout. The Team explained to the Yemen side that electric load control should be required in the target building designed to supply electricity by the stand-alone operation function, referring to the Chapter 2-2-4 in the Draft Final Report. The Team also explained that making a procedure for the load control would be supported through the soft component, and the personnel in charge should be trained.

The Yemen side agreed to take responsibility of the load control in Al Wahda Hospital by allocating appropriate trained personnel.

8. Project Cost

The Yemen side has understood that the Project cost should not exceed the amount agreed on the Grant Agreement (hereinafter referred to as "G/A"). Both sides also confirmed that the Project cost contains procurement cost of equipment, the cost for transportation up to the Project Site, installation cost, the procurement agent fee, and the consultant fee that includes the cost for soft component as a whole.

The Yemen side understood that the Project Cost Estimation attached as **Annex-3** is not final and is subject to change by the result of examination through revision of the Outline Design Study.

9. Project Schedule

Both sides confirmed the tentative implementation schedule as shown in the Draft Final Report.

10. Ownership and Responsibilities for Operation and Maintenance

The Yemen side has confirmed that the Ministry of Public Health and Population was the owner of the equipment for the PV system procured by the Project, and was responsible for the Operation and Maintenance (O&M) of the said equipment.

The Yemen side confirmed that the estimated cost for O&M described in the Draft Final Report and agreed to secure necessary budget and personnel for the O&M of Grid-connected PV system procured and installed under the Project.

11. Procurement Process of the Project

Both sides reconfirmed that procurement process would be supervised by the Procurement Agent (hereinafter referred to as "the Agent") with necessary consultation by the Consultative Committee (hereinafter referred to as "the Committee").

12. The Consultative Committee

The Yemen side confirmed that the Ministry of Planning and International Cooperation will chair the Committee in order to facilitate consultation and procurement process. The Terms of Reference of the Committee was settled in Annex-9 of the previous M/D.

The members of the Committee are as follows:

(1) Representative of Ministry of Planning and International Cooperation (Chair)
(2) Representative of Ministry of Public Health and Population
(3) Representative of Ministry of Electricity and Energy
(4) Representative of Local Council of Aden
(5) Representative of JICA Yemen Office

The meeting of the Committee shall be held immediately after the signing of the contract between the Agent and the consultant. Further meetings shall be held upon request of either the Yemen side or the Japanese side. The Agent may advise both sides on the necessity to call a meeting of the Committee.

13. Undertakings required by the Recipient Country

Both sides confirmed that the Yemen side should be responsible for following undertakings in addition to major undertakings described in the previous M/D.

(1) Allocation of land/space for installation of PV system

The owner of the land installed the equipment in the Project is Al Wahda Hospital. The Yemen side confirmed that the Ministry of Public Health and Population and Al Wahda Hospital had common understanding to use the land for the Project without any formal agreement.

(2) Preparation for the Site

Both sides agreed that Al Wahda Hospital should complete the following works for the preparation of the site by October 2010.

- To secure and keep open the space for PV system installation
- To clear and level the space for PV system installation
- To clean up the inside of electric rooms

(3) Environment and Social Considerations

Ministry of Water and Environment had submitted a letter to JICA consultant team and agreed that the Project was in accordance with Yemen's guideline for environmental and social consideration. It was confirmed that any procedures such as IEE/EIA were not necessary to conduct for the Project.

(4) Construction Permissions

Both sides confirmed that Al Wahda Hospital should obtain necessary permissions for the construction by the time of its commencement.

(5) Assignment of Counterpart Personnel

1) Overall project management

The Yemen side assigned following personnel for overall project management and coordination in each organization.

Ministry of Public Health and Population : Dr. Nasib Mansour AL-Mulagem; Director General of Medical Services

Ministry of Planning and International Cooperation : Mr. Mohammed M. Shamsaddin; Local Coordinator for Japanese ODA at MoPIC– Bilateral Cooperation with Asian and Australia Division

2) Soft Component

The Yemen side agreed to assign necessary personnel in accordance with the soft component implementation plan proposed by the Team. Both sides agreed that the positions and/or names of participants from concerned ministries and organizations would be informed at the first Consultative Committee meeting.

(6) Customs and Tax Exemption

The Yemen side agreed that the Ministry of Public Health and Population with coordination of the Ministry of Planning and International Cooperation shall be responsible for the exemption of all customs, tax, levies and duties incurred in Yemen for the implementation of the Project.

14. Confidentiality of the Project

Both sides confirmed that all the information related to the Project shall not be released to any outside parties before conclusion of all the contract(s) for the Project because they are confidential document that contains information related to the tender.

Such information includes the followings:

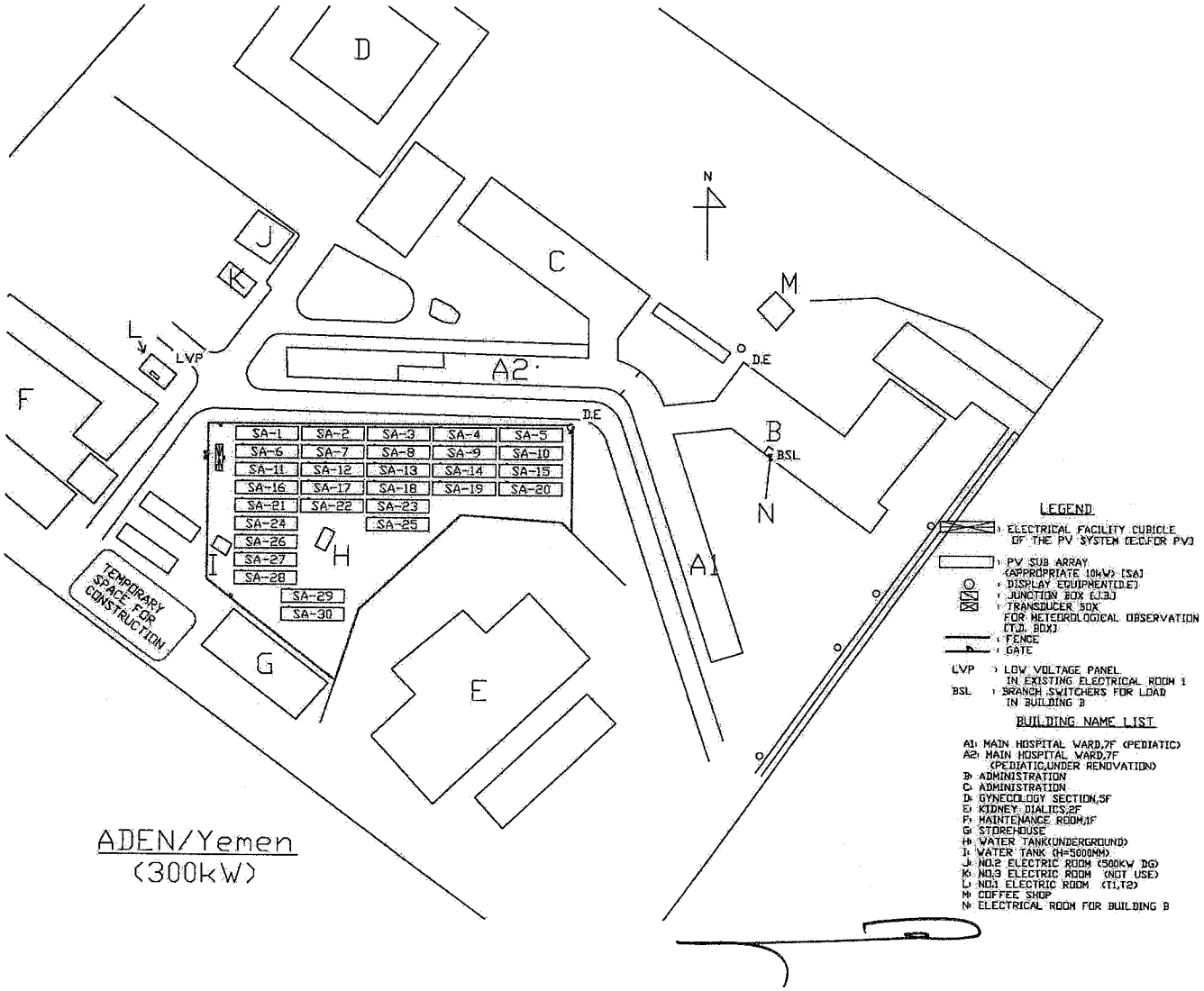
a) detailed drawings, specifications, and other technical information of the facilities and equipment;
b) cost estimation;
c) the Draft Final report;
d) the Final Report

<List of Annex>

Annex-1 Site Plan / Equipment Layout
Annex-2 List of Equipments
Annex-3 Project Cost Estimation (Confidential)

Annex-1

Site Plan / Equipment Layout



Annex-2

List of Major Equipments

Equipment		Quantity
Photovoltaic Generating System		1 system
	1-1. Photovoltaic (PV) Module	*300 kW*
	1-2. Junction Box	*1 lot*
	1-3. Power Conditioner Cubicle	*1 lot*
	1-4. Meteorological Observation Device	*1 unit*
	1-5. Branch Switcher Board	*1 unit*
	1-6. Low Voltage Panel	*1 unit*
	1-7. Electrical Facility Cubicle of the PV system	*1 unit*
	1-8. Support Structure for PV module	*1 lot*
	1-9. Miscellaneous Materials	*1 lot*
	1-10. Spare Parts, Consumables and Tools	*1 lot*
	1-11.Materials of wiring and earthing	*1 lot*
	1-12.Fence, gate and gravel surfacing	*1 lot*

Annex-3

Project Cost Estimation (Confidential)

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant Aid.

1. Cost to be borne by the Japanese side:

2. Cost to be borne by the Yemen side: approximately YR 3,700,000

Item	Amount
1. Travel expenses for participants of training programs	YR 3,705,000
2. Total (1)	YR 3,705,000

On top of this, issuing commission of the permission for the persons related to the Programme to enter the project sites and providing office space to the Consultant will be borne by the Yemen side.

3. Cost to be borne by the Yemen side for Operation and Maintenance (every year)
   (1) Personnel expenses Approximately YR 324,000
   (2) Expendable and replacement parts cost in the short run Approximately YR 318,000
   (2') Expendable and replacement parts cost in the long run Approximately YR 1,373,000
   (3) Total (in the short run) Approximately YR 642,000
   (3') Total (in the long run) Approximately YR1,697,000

The equipment to be procured in the Programme can be operated and maintained by the existing maintenance staff of the facility (Al Wahda Hospital). The O&M work will take up a little time of the staff on daily basis, which is evaluated in money term here.

At intervals the equipment will require replacement of worn out parts and consumables. In the short run, most of parts and consumables to be needed will be covered by those provided in the Programme, only minor, locally available items have to be purchased by Yemen side. After the provisions of the Programme have run out, necessary items that have to be purchased by Yemen side will increase.

4. Conditions for estimation
   (1) Time of estimation: October 2009
   (2) Foreign exchange rate: US$ 1.00 = JP¥ 96.53 , YR 1.00 = JP¥ 0.471
   (3) Others: The above estimation was carried out in accordance with relevant rules and the guideline of Japan's Grant Aid.

5. ソフトコンポーネント計画書

(1) ソフトコンポーネントを計画する背景

イエメン国における太陽光を活用したクリーンエネルギー導入計画では、イエメン国（以下、「イ」国）アデン市のアルワヒダ病院（Al Wahda 病院）に 300kW の太陽光発電設備を調達し、発生した電力により当施設の電力需要の一部を賄うものである。「イ」国においては、オフグリッドの太陽光施設の実績はあるものの、系統連系型太陽光発電設備の設置及び運用は初の事業となる。したがって、第一に当該施設において設備の運転・維持管理を担当する人材に運転・維持管理の方法を習得させるトレーニングプログラムを提供する必要がある。さらに本件に関連する電力公社（Public Electric Company、PEC）やそれを管轄する電力エネルギー省（Ministry of Electricity and Energy、MEE）の設備・技術担当部署の職員等が、太陽光発電設備と系統連系に係る技術的特性や制度的課題を理解し、今後の「イ」国における再生可能エネルギー案件取組みやそのための民間発電事業者との協働の基礎となるような、基本的な部分にも重点を置きプログラムを計画実施する。

契約業者が実施する初期操作指導・運用指導は、運転、維持管理の現場における実践的な技術の取得を目的としているが、それらの実践技術の背景にある基礎知識を伝達することにより、運転、維持管理のさまざまな局面におけるより確かな判断力、応用力の基礎づくりを行い、さらには今後の類似事業への適用という発展性も視野に入れて実施するものである。

特に本プログラムでは、系統電力の停電時に PV システム単独で施設の一部に電力供給を行う「自立運転機能」を備える設備を導入するため、その利用にあたっての制約や課題を理解し、適切な運用を行えるように配慮する必要がある。

具体的には、設備の運転･維持管理を直接担当することになるアルワヒダ病院の技師は、これまでディーゼル発電機を含む病院の電気設備の維持管理を実施してきており、経験的に設備やその管理手法を把握しているものの、例えば図面等を利用して設備を把握したり管理記録を文書で残したりといった管理手法には慣れていないため、その指導にあたっては、まずは電気設備の管理に関する基礎的な部分に重点をおく必要がある。特にプログラムの最初に計画されている「基礎技術講義」については、参加者の力量を見極めながらその内容を調整することも検討する。一方、電力公社及び電力省の担当においては、本事業のために系統連系の制度的扱いを検討するという課題がある。また、現時点では逆潮流は行わない設計であるが、本プログラムを通じて将来的にはその可能性を検討するきっかけを与えたいという意図もある。したがって、逆潮流を含む系統連系の技術的要件を踏まえ、また電力システムにおける再生可能エネルギーの有効性を評価しながら、今後のエネルギー政策と必要な制度設計の検討に資する知識の習得が望まれる。同時に、電力公社には、アルワヒダ病院で実施される設備の維持管理作業を側面から技術支援する役割も求められているため、太陽光発電設備についての技術的理解を高めておくことも重要である。

「イ」国には再生可能エネルギー発電の系統連系の実績の無いこと、系統の電力が極めて

不安定であること等の問題があり、運用開始 3 ヵ月後に契約業者に設備の点検を行わせることとしているが、上述のとおり維持管理担当者の技量を見極めながらプログラムを実施する必要のあることも踏まえ、技術力の育成も同様のタイミングで実施し、習熟教育を充実させて、安全性の高い運転・維持管理技術の定着とその持続性を確実なものにする。

(2) ソフトコンポーネントの目標

上記の目的を達成するため、以下のような目標を設定する。

［現場の運転・維持管理人材について］

- 操作員の通常時、緊急時の運転維持管理について、現場での操作方法だけでなく、太陽光発電設備の機能面、及び施設内の既設電力設備との関係において理解すること
- 操作員が、日常及び長期的な維持管理と点検、必要なスペアパーツや消耗品の調達や交換等の技術を持つだけでなく、それらの長期的な設備運用における重要性を理解すること
- 以上について、自ら日常的な作業ルーチンを検討し、運転維持管理計画を作成できること
- 自立運転の電力供給先において、適切な負荷の選択や配置の検討ができること
- 当該施設内外の新たな運転・維持管理人材の育成や指導を行うための基礎知識を得ること
- 広報用リーフレットを作成し、外来者、見学者等にシステムの説明が行えること

［電力公社、電力省職員等の人材について］

- 太陽光利用の理論・技術的特性や制度づくりにおける課題を理解すること
- 発電事業者と電力公社との協定等に必要な技術的事項を理解すること
- 新たな運転・維持管理人材の育成や指導、新たな事業を計画し実施するための基礎知識を得ること
- 広報用リーフレットを活用し、太陽光利用を促進する活動が行われること

(3) ソフトコンポーネントの成果

- 運転維持管理計画書が作成され、設置した太陽光発電設備が計画通り運転され、自立的、持続的に維持管理されている。
- 自立運転の供給先で適切な負荷の配置がなされ、安全な運転が行われている。
- これらの活動について、チェックシート等を用いて活動の振り返りが行われている
- 再生可能エネルギー発電設備の計画論と、その系統連系に係る制度設計に関連する基礎的な技術的知識が、電力省と電力公社の担当者に備わっている。
- 広報用リーフレット等を活用した啓発活動が持続的に行われている。

(4) 成果達成度の確認方法

目に見える成果としては、運転維持管理計画書がある。運転維持管理計画書とは、契約業者から提供されるマニュアルや操作指導をベースに、施設の運転･維持管理担当者の活動を短期（日常）、中期（隔月～年）、長期（本格点検：7 年周期）に区分して整理し、具体の活動計画としてスケジュール組みするとともに、それぞれの活動についてチェックシートを作成し、実施の確実性を担保するための計画書である。後述するとおり、本ソフトコンポーネントのプログラムは、竣工前後と運開 3 ヵ月後の 2 回に分けて実施する。運転維持管理計画書は、まず竣工前後の活動で参加者の演習課題として作成し、さらに運開 3 ヵ月後の演習では 3 ヵ月間の実績を踏まえた修正や改善を加える。この作成過程では、単なる操作方法に関する知識だけでなく、上記「ソフトコンポーネントの目標」で強調される「基礎知識」や「理解」が試されることになる。この「基礎知識」や「理解」が、自立的、持続的な設備の運用を実現するために極めて重要となる。

同様に、トラブルシューティングマニュアルは、日常的な障害への対応方法について、運転･操作担当者らが自ら答えを探して取りまとめるという過程で作成するものであり、「基礎知識」や「理解」の程度を計るとともに、その深度化を図ることができる。さらに、類似事業の水平展開の際に有効に利用される材料ともなりうる。

以上のような演習項目は、まずは参加者主導で実施し、その結果から参加者の理解度を評価したうえで、参加者と指導者のなかでディスカッションを行い、或いは必要に応じ追加的説明や指導を行って、再度参加者を中心に作業を進めるという、3 段階で実施する。これにより、演習開始前のトレーニング内容に関する成果達成度と演習（後）の成果達成度の両方を把握する。

つぎに広報用リーフレットは、当該国の再生可能エネルギー利用の事情を踏まえて作成するもので、当該設備の紹介や再生可能エネルギー利用の啓発等の目的で配布･使用される。

その他の竣工前後プログラムの実施成果の評価は運開 3 ヵ月後プログラムの着手時に以下のような方法で評価を行う。また、運開 3 ヵ月後プログラムを含めた全体プログラムの評価は、最終段階でのワークショップ向けに作成される資料で評価されるほか、アンケート等を実施して補助的な評価を行う。

- 運開後 3 ヵ月間の運転記録、日常点検ログの確認・評価
- 運開後 3 ヵ月間の事故・障害時対応ログの確認・評価
- 運開 3 ヵ月後に実施するトラブルシューティングにおける Q&A 内容の評価
- 演習、そのアウトプットとしてのワークショップ資料等で、設備全体のマネジメントにかかる知識取得状況を評価
- 運開 3 ヵ月後プログラムの終了時に実施するアンケート

以上のような方法においても、理解・習得すべき事項に関する質問や特定の課題を与える

ことにより、トレーニングの効果が把握できるよう工夫する。

(5) ソフトコンポーネントの活動（投入計画）

1) 実施内容

ソフトコンポーネントは、上記の目標を達成するために一連の講義、演習、OJT 等を本邦コンサルタントが実施する。実施内容としては、太陽光発電設備の竣工前後の期間と運開 3 ヵ月後の期間を利用して、以下のような事項とする。

なお、前節で述べたとおり、調達・工事契約のなかには初期操作・運用指導が含まれているため、本件のソフトコンポーネントは、契約業者により実施される操作・運用指導とタイミングを合わせ、必要な技術と知識が研修対象者に効率的に伝わるよう計画する。下記の実施項目のうち（◆）印をつけた項目については、契約業者の実施する運転・維持管理指導に対し、ソフトコンポーネントでフォローアップを行う部分を示している。同項目については、契約業者の指導内容を受け、受講者にとって単なる「操作方法の暗記」にならないよう、システム全体の機能の中で操作の意味を理解できるような指導をソフトコンポーネントのなかで行う。

<u>竣工前（約 4 週間前から）</u>

基礎技術講義として、

- 太陽光発電の理論的基礎
- 太陽光発電の利用方法
- 系統連系の仕組みと計画
- 余剰の発生と逆潮流の理解
- 施設への系統からの電力供給
- 施設内電力需要、負荷の理解（演習含む）
- 配電線停電時の太陽光設備の対応
- 自立運転の必要性と保護原理
- 自立運転給電先の負荷マネジメント太陽光発電設備の計画（演習含む）
- 太陽光発電設備の計画（演習含む）
- 発電設備設置者の電力会社の間の取り決め

工事（接続）計画演習として

- 太陽光発電設備の据付
- 施設内の配電（演習含む）
- 施設内の電力設備と太陽光設備の接続（演習含む）
- 工事工程の計画（演習）
- 施工管理と検査・引渡し

OJT として

- 接続工事立ち会い
- 竣工検査立ち会い、等

竣工後

契約業者の運転指導に対するフォロー

- 起動、停止、再起動（演習含む）◆
- 日常管理の実施指導（演習）◆
- 定期点検について（演習含む）◆
- 機器構成と消耗品、軽微な交換作業（演習含む）◆
- 事故障害の発生と対応（演習含む）◆
- 自立運転時の操作方法（演習含む）◆

運転・維持管理活動の計画

- 日常管理のチェックシート作成（演習含む）
- 事故・障害の記録
- 設備が良好に維持される電気設備の管理方法（清掃等含む）
- 自立運転時のトラブル対応（演習含む）
- 以上の成果を、運転維持管理計画書として取りまとめ（演習含む）

再生可能エネルギー利用促進の啓発活動として

- 広報用リーフレット作成
  （発電設備見学者他への配布を目的とした広報用リーフレットを PDF で作成）

一方、竣工・運転開始後の初期設定不具合や運転操作の習熟度の浅さから設備にトラブルや不十分な稼働が発生することがしばしばあり、これらの事象は日本でも海外でも同様である。そのため、設備運開後にしかるべき期間を置いて、再度の習熟教育プログラムを実施することが必須である。このようなトラブルや不具合は、運転開始直後に集中的に発生し、その対処が進めば収束に向かうのが一般的である。問題が発生して対処の無い状態で長期間放置しないという観点からは早いタイミングで実施することが望ましいが、一方あまり運転実績が短いようでは設備の状態を把握するデータが少なく、また運転員の経験が積みあがっていない。ここでは、ある程度人と機械の運転実績が揃うおよそ 3 ヵ月以降の早い時期をタイミングとして、再度教育プログラムを実施する計画とし、実際に設備を運転した経験を踏まえ、設置した設備や設置先施設に固有の運用上の問題や事故障害解決上の問題点等を抽出して、運転維持管理計画書等への反映を行い、より現実に即した確実な運用方法を確立すると共に、以降に発生することが予想される事故障害への迅速な対応を図る。また、発電量等の運用実績に対し分析を加え、季節変動への対応を含むより高度な運転計画や簡易な財務分析を演習として実施し、発電設備の計画からマネジメントに係る技術の育成を行う。さらに、契約業者が実施する 3 ヵ月点検とプログラムの時期を合わせ、点検調整への立

会い・見学をプログラムの一部とするほか、点検調整時の模様をビデオ等で撮影し、契約業者の技術者がそれぞれの機器に対して実施する点検や調整、部品交換の模様、現場で発生する質問と回答･指導などのやり取りを正確に記録する。この記録は、後続する演習の中で参照することも可能であるが、基本的には編集して記録メディアに保存し、新規運転･維持管理スタッフ参加時のトレーニングや活動状況の振り返りの際などに参照して保守点検技術の継承に利用するほか、類似案件が計画･実施される際の水平展開に活用することで、完了時点で発現した協力対象事業の成果が、より長い期間発現し、その結果全体プロジェクトの目標が達成することを目指す。

実施内容としては、以下のような事項となる。

運開３ヵ月経過時

定着度確認

- 運転操作指導を中心とした基本操作の定着度確認
- 日常的な運転・維持活動に関する定着度確認

運転実績に基づいた運転・維持管理活動の見直し

- 日常管理、事故時等の記録の検証による 3 ヵ月間の運転･維持管理実績の評価（プログラムのインプットとして）
- トラブルシューティング（アンケート、質疑等により、現実の課題を抽出し解決策を探る）
- 自立運転操作記録の確認・評価と対応の見直し（演習含む）
- 日常管理チェックシート見直し（演習含む）

長期継続運転を目指した発電設備の維持管理技術の向上

- 季節の変化等を考慮した運転計画見直し
  （日射量および負荷の季節変化に対応した運転時刻の設定、余剰発生の検討、等）
- 3 ヵ月点検立ち会い
  （3 ヵ月点検はフューズ等の消耗品の一部をメーカー検査員が交換することを含）
- 定期点検の映像による記録
  （上記 3 ヵ月点検等をビデオ撮影し DVD 等の記録メディアに保存する）

運転実績に基づいたトラブルシューティングマニュアルの作成

- 一定の運転期間中にサイト運転員が記録した運転記録・トラブル記録（運営組織のトラブル含）について、日本側と対応案を議論する。またこれらの事例と対策を取りまとめて、トラブルシューティングマニュアルを作成。

適正な太陽光発電設備運営・管理体制の強化に対する支援

- 発電設備の簡易財務分析
  （発電実績に基づいた想定収入とメンテコスト実績から収支を想定）

- 発電設備運用のためのマネジメント手法の確立
  （より持続的な体制のあり方についての議論）
- 電力需要の増加への対応、有効利用に向けた計画策定
  （電力利用実態を分析し、需要マネジメント（DSM）の可能性等を検討する）

総合演習

- 運転維持管理計画書のアップデート（演習含む）
- 理解度確認アンケート

ワークショップ

- 運転維持管理計画書・トラブルシューティングマニュアルの発表と、財務分析を含む運用状況の報告

a) 実施対象者

対象者は、以下のとおりとする。

施設管理担当者 ： 実際に太陽光発電設備を管理するアルワヒダ病院の技術担当。

電力公社担当 ： 電力公社の職員で、配電、売電、発電管理等の部署の責任者／担当者レベルが想定される。技術系の素養を持ち、大学で電気工学を履修した者であることが望ましい。

電力省担当 ： 電力省の職員で、電力関係の制度設計、施設計画等の部署の責任者／担当者レベルが想定される。技術系の素養を持つこと（工学系の大学卒業者）が望ましい。

その他 ： 仮に、保健省等他の機関からの希望がある場合は、公共施設の計画、維持管理担当者の参加が考えられる。

上記対象者とその参加プログラムは、以下のとおりとなる。

表 1　各プログラムと想定参加者

実施項目	施設管理担当（3－4 名程度）	電力公社担当（2－3 名程度）	電力省担当（2－3 名程度）	その他（3 名程度）
竣工前				
基礎技術講義	○	○	○	○
工事計画演習	○	○	○	
OJT（検査等立ち会い）	○	○	○	
竣工後				
運転操作指導のフォロー	○	○		
運転・維持管理活動の計画	○			
啓発活動（広報リーフレット）	○	○	○	
運開 3 ヵ月後				
定着度確認	○	○		
実績に基づいた活動の見直し	○			
発電設備維持管理技術向上	○			
トラブルシューティングマニュアルの作成	○	○		
発電設備運営・管理体制の強化	○		○	
総合演習	○	○	○	○
ワークショップ	○	○	○	○

b)　実施工程

以上の活動について、そのスケジュールを以下に挙げる。

表 2　ソフトコンポーネント 1：竣工前後の活動

	活動	-4 週	-3 週	-2 週	-1 週	-0 週	1 週	2 週	3 週
活動内容	準備作業								
	基礎技術講義								
	工事計画演習								
	OJT（検査等立ち会い）								
	操作・運用指導								
	管理計画書演習								
	啓発（広報リーフレット）								
受講者	病院施設管理担当者								
	電力公社								
	電力省担当								
指導者	ソフコン管理者		4 週						
	ソフコン管理補助員						4 週		
	通訳				8 週				

表 3 ソフトコンポーネント 2:3 ヵ月点検時の活動

	活動（担当指導者）	1 週	2 週	3 週	4 週
活動内容	定着度確認（保守）	―			
	実績に基づいた運転・維持管理活動の見直し（組織）		―		
	発電設備維持管理技術向上（保守）			―	
	トラブルシューティングマニュアルの作成（保守）		―		
	太陽光発電所運営・管理体制の強化（組織）			―	
	総合演習（保守および組織）				―
	ワークショップ（保守および組織）				▼
受講者	病院施設管理担当者	―	―	―	―
	電力公社		―		―
	電力省担当			―	―
指導者	ソフコン管理者（保守技術担当）	―	4 週		―
	ソフコン管理補助員（組織運営担当）		―	3 週	―
	通訳	―	4 週		―

(6) コンポーネントの実施リソースの調達方法

前述のとおり、系統連系型太陽光設備については「イ」国内に実績がないため、ソフトコンポーネントの実施は、本邦コンサルタントが実施することになる。コンサルタントは、系統連系型の太陽光設備の計画、実施について実績を持つものが望ましい。

指導に当たる本邦コンサルタントについては、竣工前後の実施時は、責任者と補助者の 2 名体制、運開 3 ヵ月後の実施時も、同様の体制とする。ただし、運開 3 ヵ月後の実施時は責任者が保守技術を担当し、補助者が組織運営を担当することで効率的に活動を進めていく。ローカルリソースについては、「イ」国で経験のないシステムの導入であるため、特に雇用は予定しない。

当該国の公用語はアラビア語であり、想定される参加者の中でも特に施設の設備管理技師等は、英語でのコミュニケーションはまったく不可能な場合がある。また、現地で調達可能な英ーアラビア語通訳にはどうしても専門用語の面で問題があるため、本邦コンサルタントが英語で講義を行い、それをさらにアラビア語に翻訳することは極めて不正確でわかりにくい講義となる危険性がある。したがって、通訳は日-アラビア語とし、基本的に日本から委託・派遣をすることが望ましい。さらに、本計画の主要な機材であるパワーコンデショナ等は日本製であり、各種参考資料は日本語で書かれている可能性が高い。日-アラビア語通訳を雇用すれば、ソフトコンポーネントの活動実施中も、必要に応じて追加的な翻訳（日本語からアラビア語）を行うことが可能となるなど、ソフトコンポーネントの内容に柔軟さを確保する効果も期待される。

プログラムの各実施項目にかかるコンサルタントの作業人日は、以下を計画する。これにより、竣工前後のプログラムで週日稼働日 40 日、運開 3 ヵ月後プログラムで同 20 日となる。日本からサイトへの移動時間を含め、それぞれ 2 ヵ月間、1 ヵ月間の業務量となる。

表 4 コンサルタントの作業計画

実施項目	作業内容	必要人日
準備作業　　計 5 日	・ MEE、PEC と実施内容について協議 ・ アルワヒダ病院と実施内容について確認 ・ 契約業者と実施内容について確認 ・ 資料準備等	2 日 1 日 1 日 1 日
竣工前　　計 15 日		
基礎技術講義	・ 太陽光発電の理論的基礎 ・ 太陽光発電の利用方法 ・ 系統連系の仕組みと計画 ・ 余剰の発生と逆潮流の理解 ・ 施設への系統からの電力供給 ・ 施設内電力需要、負荷の理解（演習含む） ・ 配電線停電時の太陽光設備の対応 ・ 太陽光発電設備の計画（演習含む） ・ 発電設備設置者の電力会社の間の取り決め ・ 自立運転の必要性と保護原理 ・ 自立運転給電先の負荷マネジメント	左記を 約 10 日 間で実施
工事計画演習	・ 太陽光発電設備の据付 ・ 施設内の配電（演習含む） ・ 施設内の電力設備と太陽光設備の接続（演習含む） ・ 工事工程の計画（演習） ・ 施工管理と検査・引渡し	0.5 日 ↓ 1 日 1.5 日 1 日
OJT（検査等立ち会い）	・ 契約業者の検査に、各日数時間ずつ立ち会い	（5 日）
竣工後　　計 20 日		
運転操作指導のフォロー	・ 各日数時間の運転操作指導の後に次項を実施 ・ 各指導項目につき、マニュアルと基礎技術講義の資料を使用し、PV システム及び施設内電力設備全体との関連において説明。ディスカッション形式	5 日
運転・維持管理活動の計画	・ これまでの内容を踏まえ、日常的な運転・維持管理活動を列挙、活動について、チェックシートを作成 ・ 定期的な点検項目について列挙 ・ 各点検につき作業項目を抽出、チェックシートを作成 ・ 長期的な維持管理・点検活動のスケジュール作成 ・ 自立運転の利用について、注意事項を列挙 ・ 建物内の負荷の実地確認と調整演習 ・ 自立運転利用のガイドライン作成	左記を 約 10 日 間で実施
啓発活動（広報リーフレット）	・ リーフレットの構成、記載内容、デザイン等を検討、作成	5 日
運開 3ヵ月後　　計 20 日		
定着度確認	・ コンサルタントによる運転記録等の確認 ・ 基本運転操作技術の確認 ・ 日常的な運転・維持活動に関しディスカッション・整理	1 日 1 日 1 日
実績に基づいた活動の見直し	・ 日常管理、事故時等の記録の検証による 3ヵ月間の運転・維持管理実績の評価・検証 ・ トラブルシューティング（アンケート、質疑等により、現実の課題を抽出、解決策を議論） ・ 自立運転操作記録の確認・評価と対応の見直し（演習含む） ・ 日常管理チェックシート見直し（演習含む）	1 日 1 日 1 日 1 日
発電設備維持管理技術向上	・ 季節の変化等を考慮した運転計画見直し（季節変化による発電量（日射量）および負荷の変化に対応した運転計画） ・ 3ヵ月点検立ち会い（3ヵ月点検はフューズ等の消耗品の一部をメーカー検査員が交換することを含） ・ 上記 3ヵ月点検をビデオ撮影し DVD 等の記録メディアに保存	1 日 2 日 （各半日） （2 日）
トラブルシューティングマニュアルの作成	・ 上記の実績評価と対策案を取りまとめ、トラブルシューティングマニュアルを作成	1 日
発電設備運営・管理体制の強化	・ 発電設備の簡易財務分析（発電実績に基づいた想定収入とメンテコスト実績から収支を想定） ・ 設備運用のためのマネジメントについて議論 ・ 電力需要の増加への対応、有効利用に向けた計画策定（電力利用実態を分析し、有効活用に向けた提言を行う）	1.5 日 1 日 1.5 日
総合演習	・ 運転維持管理計画書のアップデート（演習含む） ・ 理解度確認アンケート ・ ワークショップ資料作成	2 日 1 日 2 日
ワークショップ	・ 運転維持管理計画書・トラブルシューティングマニュアルの発表と、財務分析を含む運用状況の報告	1 日

(7) ソフトンポーネントの実施工程

2010 年 10 月に、調達代理機関と契約業者の間の契約が調印されると想定し、以降のスケジュールにおいて次のようなソフトコンポーネント実施を計画する。

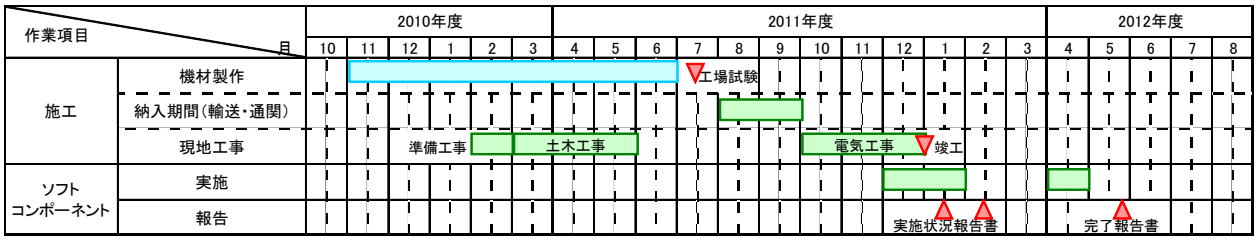


図 -1 ソフトコンポーネントの実施スケジュール

なお、ソフトコンポーネントの実施に先立ち、参加者の選定や実施内容等に関して受入国側の各機関との調整・準備作業が必要となるが、これは、現地工事（土木工事、及び電気工事）の期間中に派遣されている工事監理コンサルタントが仲介をしながら進めることとし、受入国側に十分な準備期間を確保することとする。

(8) ソフトコンポーネントの成果品

成果としては、以下のものが挙げられる。

・本邦コンサルタントが作成したプログラム用テキスト
・実習で作成した施設内の結線図等
・広報用リーフレット
・実施状況報告書
・定期点検の映像による記録・
・運転維持管理計画書及びその修正版
・トラブルシューティングマニュアル
・ワークショップ発表資料
・アンケート結果（及びその評価）
・完了報告書（ログの評価やトラブルシューティングの内容記録含む）

(9) ソフトコンポーネントの概算事業費

上記計画のソフトコンポーネント概算事業費は、以下のとおりである。

全体概算額	21,363,000 円	（消費税除く）
うち直接人件費	3,220,000 円	
直接経費	14,022,000 円	
間接費	4,121,000 円	

上記概算事業費の内訳は、巻末の資料に添付する。

(10) 相手国実施機関の責務

サイトはアデン市市街地にあるため、アデン市からの参加者にとっては特に大きな旅費等は発生しない。一方、仮に首都サヌアや他の都市からの参加がある場合には、旅費、宿泊費、手当等が必要となるが、これは相手国側の負担（参加者の所属先）となる。

またプログラムへ参加にあたっては、数週間の期間にわたり職場から離れる必要があるが、実施の効果を担保するためには、スケジュールに従って継続的に参加することが求められる。したがって、職場での理解と上長からの指示が明確に行われることが必要となる。

さらに、特に行政サイドからの参加者の選定にあたっては、今後、「イ」国の太陽光や再生可能エネルギーの実務を担当するものを参加させることが重要である。

資料：概算事業費（ソフトコンポーネント）内訳

No.	名　称	区　別	低減率など	単位	数量	単価 日本円	単価 現地貨	単価 US$	金額 日本円	金額 現地貨	金額 US$	備　考
1.	**直接人件費**							**総合計**	**3,220,200**			
	主任管理技術者		2号	人・月	2.00	942,000			1,884,000			H21年度人件費
	機材（重気・設備）担当		3号	人・月	1.70	786,000			1,336,200			H21年度人件費
			現地合計		**3.70**							
2.	**直接経費**							**総合計**	**12,816,120**	**916,094**	**8,031.75**	
	(1) 通訳 （日本語ーアラビア語）	90日		人・月	90.00	60,000			5,400,000			JICA機材マニュアル
												(2009.4.P59)
	(2) 現地傭人費											
	事務管理員		1名	人・月	2.75			457.20			1,257.30	労務単価 32
	運転手		1名	人・月	2.75			685.80			1,885.95	労務単価 33
	(3) 旅費・日当・宿泊費											
	1) 航費											
	① 航空運賃（羽田ーサナア）											
	主任管理技術者		2号	往復	2.00	927,770			1,855,540			資材単価9-075
	機材（重気・設備）担当		3号	往復	2.00	654,875			1,309,750			資材単価9-076
	通訳担当		4号相当	往復	2.00	654,875			1,309,750			資材単価9-076
	② 航空運賃（サナアーアデン）											
	主任管理技術者		2号	往復	2.00			196.00			392.00	資材単価9-077
	機材（電気・設備）担当		3号	往復	2.00			196.00			392.00	資材単価9-077
	通訳担当		4号相当	往復	2.00			196.00			392.00	資材単価9-077
	③ 国内旅費											
	主任管理技術者		2号	往復	2.00	4,140			8,280			JICAガイドライン機材
	機材（重気・設備）担当		3号	往復	2.00	4,140			8,280			2009.03.P47
	通訳担当		4号相当	往復	2.00	4,140			8,280			
	2) 日当											
	主任管理技術者		2号	人・日	30.00	4,500			135,000			JICA機材マニュアル
	機材（電気・設備）担当		3号	人・日	30.00	3,800			114,000			(2009.3.P61)
	通訳		4号相当	人・日	30.00	3,800			114,000			
				人・日	30.00	3,800			102,600			
	主任管理技術者		2号	人・日	30.00	4,500			135,000			JICA機材マニュアル
	機材（電気・設備）担当		3号	人・日	21.00	3,800			79,800			(2009.3.P61)
	通訳		4号相当	人・日	30.00	3,800			114,000			
	3) 宿泊費・宿舎借り上げ費											
	① 宿泊費											
	主任管理技術者	30日-4日=26日	2号	人・日	26.00	13,500			351,000			JICA機材マニュアル
	機材（電気・設備）担当	30日-4日=26日	3号	人・日	26.00	11,600			301,600			(2009.3.P61)
	通訳	30日	4号相当	人・日	30.00	11,600			348,000			
		30日-4日=26日	4号相当	人・日	26.00	11,600			271,440			
	主任管理技術者	30日-4日=26日	2号	人・日	26.00	13,500			351,000			JICA機材マニュアル
	機材（電気・設備）担当	21日-4日=17日	3号	人・日	17.00	11,600			197,200			(2009.3.P61)
	通訳	30日-4日=26日	4号相当	人・日	26.00	11,600			301,600			
	(4) 諸理用電輌費											
	1) 車輌借上費											
	ソフトコンポーネント管理車両			月	2.75			1,350.00			3,712.50	材料単価9-061
	2) 車両燃料費			月	2.75		13,325			916,094		燃料算出根拠
3.	**原接費**								**4,121,856**			
	(1) 諸経費	直接人件費×90%		式	0.90	3,220,200			2,898,180			JICA土木マニュアル
	(2) 技術経費	（直接人件費+諸経費）×20%		式	0.20	6,118,380			1,223,676			(2007.4.P125.127)

6. 参考資料

収集資料リスト

調査名 太陽光を活用したクリーンエネルギー導入計画準備調査（イエメン国）

番号	資料の名称	形態（図書・ビデオ地図・写真等）	オリジナル・コピーの別	発行機関	発行年
1	Renewable Energy Strategy and Action Plan Task 2 Renewable Energy Development Strategy	電子データ	コピー	イエメン国政府	2008
2	電力法ドラフト	電子データ	コピー	イエメン国政府	2008
3	地方電化局設立法	電子データ	コピー	イエメン国政府	2009
4	Third Five-year Development Plan for Poverty Reduction (2006 – 2010) Electricity Sector	電子データ	コピー	電力エネルギー省	2006
5	ENVIRONMENT PROTECTION LAW No. (26) of 1995	電子データ	コピー	水資源環境省	1995
6	THE NATIONAL STRATEGY FOR ENVIRONMENTAL SUSTAINABILITY 2005-2015 AND NATIONAL ENVIRONMENTAL ACTION PLAN 2005-2010 2005	電子データ	コピー	水資源環境省	2005
7	Initial National Communication under UNFCCC	電子データ	コピー	水資源環境省	2001
8	PEC 送電網図	電子データ	コピー	PEC	2006
9	Al Wahda 病院説明資料（Arabic）	電子データ	コピー	アルワヒダ病院	2008

7. その他資料・情報

MINUTES OF MEETING

Project for Introduction of Clean Energy using Photovoltaic Power

Subject	The scope of PV system of Wihda Hospital
Date	October 19, 2009.
Time	10:00 a.m. – 12:00 p.m.
Place	Meeting room at Al Wihda Hospital, Aden
Participants	1. Al Wihda Hospital members
	2. JICA STUDY TEAM

Result of Meeting

1. Proposed PV Project

JICA STUDY TEAM explained [**Proposed PV Project at Al Wihda Hospital**] to Al Wihda Hospital (the hospital) as per attachment-1, and Al Wihda Hospital agreed with Proposed PV Project.

And JICA STUDY TEAM explained the basic design of Low Voltage Panel to the hospital as per attachment-2, and the hospital agreed with the basic design of Low Voltage Panel in No.1 electrical room.

2. Request and suggestion by Al Wihda Hospital

Regarding electric power supply in the case of power failure (blackout) of the Grid requested by the hospital, JICA STUDY TEAM agreed to provide "stand alone operation" which enables sending power from PV system to Building B during blackout.

3. Request and confirmation by JICA STUDY TEAM

The hospital understood that application procedures necessary to obtain approvals and/or licenses related to installation, operation and grid-connection to the PV system shall be initiated by the hospital.

4. Temporary facilities of construction

Al Wihda Hospital prepares the space in the hospital for the storage of the materials imported from Japan and other temporary facilities during construction at free of charge.

5. Others

The hospital understood that the final scope of the PV system and the design of the Project shall be determined by the JICA Headquarters and the Government of Japan.

Aden, October 19, 2009

Al Wihida Hospital

19.10.09

Dr.Mohamed Salem Baazab
General Manager of
Al Wihida Hospital

JICA STUDY TEAM

西田雅

Masaru Nishida
Chief of Consultants of
JICA PV Study Team

Discussion on Proposed PV Project at Al Wihda Hospital

Date: October 17th, 2009

Place: Al Wihda Hospital

1. Scope of the Project

The Project proposed will provide Al Wihda Hospital with the Works as shown below.

- Installation of PV system with a capacity of 300kW
- Installation of Electrical Facility Cubicle
- Replacement of Low Voltage Panel in Electric Room No.1 and a Branch Switcher Board in Building-B
- Installation of fences and gates surrounding PV modules

The PV system under planning is also presented as in Attachment 1 and the following drawing list.

[List of Drawings to be presented]

- YE-01 SINGLE LINE DIAGRAM (EXISTING NO.1 ELECTRIC ROOM)
- YE-02 SINGLE LINE DIAGRAM (GRID CONNECTION POINT)
- YE-04 GENERAL LAYOUT PLAN
- YE-12 CABLE LAYOUT PLAN (OUTSIDE)
- YE-15 EQUIPMENTS LAYOUT&MODIFICATON (EXISTING ELECTRIC ROOM NO.1)
- YE-16 EQUIPMENTS LAYOUT&MODIFICATON (BUILDING B)
- YE-18 PAVING STONE PLAN
- YE-19 LAYOUT OF FENCE AND GATE
- YE-20 FENCE, GATE (DETAIL)

2. Operation of the PV System

(1) Operation under normal condition

PV System is designed to start sending power in the morning and stop in the late afternoon every day, by a scheduled timer.

If the power from the power company (PEC) network is cut (black out), the PV system automatically shuts down. After the power is back, the PV system must be restarted manually.

(2) Stand-alone operation under power cut from Power Company

Upon a request from the Hospital, the PV system is designed to be equipped with "stand-alone operation function", which enables the operation of the PV system during black out. Stand-alone operation may be activated as follows:

- When the electricity supply from PEC is down, the PV system will be shut down automatically.
- Then, by manual operation, the PV system may be restarted to meet the limited demand of the Hospital.
- "The limited demand" is proposed to be those in Building-B (Administration Ward) as it has not been supplied with power from back-up diesel generator.
- The PV system may not be able to meet the electricity demand in the whole Building-B, as a PV system has inherent unreliability due to the weather. Those part of the building to be supplied with power by PV system during black out can be selected by switches in "Branch Switcher Board in Building-B ".
- When the power from PEC is back, by manual operation, the PV system must be once shut down and restarted in normal operation mode.

(3) Maintenance

- Daily inspection will have to be done once a day by maintenance staff of the Hospital.
- Other periodical inspections will be necessary, which may involve replacement of consumables and worn-out parts.

3. Construction

There are a few important matters that need to be understood about the construction work.

(1) Interruption of Power Supply to the Hospital at the power system switch

The electric panels (boards), one in the Electric Room No.1 and the other in Building B, will have to be replaced by new ones. The replacement work requires interruption of power supply from PEC, to relevant part of the Hospital, that are Building A, B, and F.

There will be mobile diesel generators to be employed by the Contractor as substitute source of power. However, there will be absolute power cuts to the Hospital, a few times during the Work, to switch the source of power from/to PEC to/from mobile diesel units.

Details of the Work will be planned, and submitted for approval of the Engineer, by the Contractor.

(2) Need to Secure Temporary Storage of Materials and Equipment

The Hospital is requested to secure, free of charge, the space in the Hospital for storing materials and equipment transported from Japan. The area suitable for the purpose is shown in a green rectangle in Figure 1.

(3) Temporary Storage of Construction Waste

The construction work will produce large amount of wastes. They will have to be stored temporally somewhere in the premise of the Hospital before the Contractor dispose of it in a proper and lawful way.

4. Preparation for the Project

(1) Application for the interconnection of the PV system to PEC network.

As the Hospital will become an owner of generation equipment for his own use, and the equipment will be interconnected to PEC network, a necessary procedure, which may involve applying for a license, will have to be initiated by the Hospital.

(2) Preparation of the Site

The following matters should be undertaken by Yemeni side.

- To secure and keep open the space for PV system installation
- To clear and level the space for PV system installation
- To clean up the inside of electric rooms before the construction work starts.

5. Project Schedule (tentative only)

- Preparation of contract with the Contractor : mid 2010
- Commencement of the Work at the Site : early 2011
- Completion of the Project and Commissioning : early 2012

6. Matters to be Confirmed

- Cable list in Existing Electric Room NO.1
- Load list of Building B
- Drawings and/or information of underground structures, pipes and cables in the installation areap
- Expected increase of power demand after re-opening of rehabilitated part of the Building A
- Expected date of completion of the rehabilitation work
- Some details of financial statement of the Hospital

Attachment-1

Basic Specification of PV System (Draft)

Name of Site :Al Wahidah Hospital Aden

Item	Specification
Type of the PV system	Grid connection (No Storage Battery)
Capacity of the PV system	300kW
Basic configuration of the PV system	Refer to Fig.1
Basic layout of the PV system	Refer to the drawing NO.YE-04
Electrical facility cubicle of the PV system	Refer to Fig.2
Grid connection point	Low voltage (At secondary side of the transformer)
Support stand of the PV module	Hot dip zincing
Reverse power flow	Do not supply surplus power to the grid. (Prohibition from electric power company)
Protection Relay of Grid connection	Over current(OC), Over voltage(OV), Under voltage(UV), Over frequency(OF), Under frequency (UF), Islanding detector
Electric power supply in the case of power failure (blackout)	Building B is to be fed with power from the System during power failure (blackout) of the grid (PEC network)
Display system	2 sets to be installed. Information to be displayed are 1) Current Output of the System (kW) 2) Energy Generated the day (kWh) 3) Estimated reduction of CO2 emission
Fence and Gate for PV system	Refer to the drawing NO.YE-19,YE-20
Meteorological observation device	Solar radiation and Thermometer system at the PV panels
Language of operation and maintenance manuals	English

Note) Due to the instability of PV output, PV system cannot supply power to critical load such as life supporting equipment.

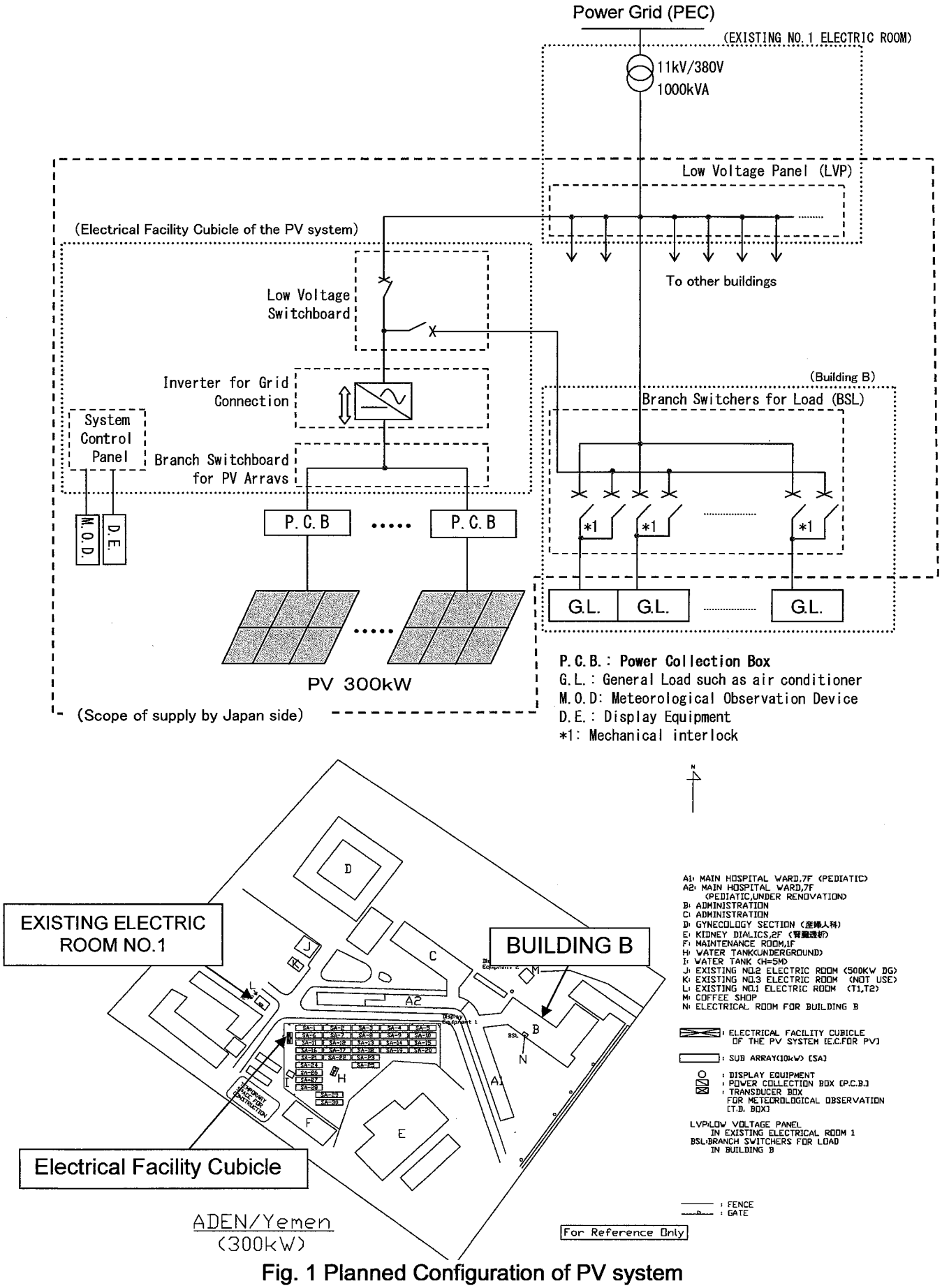


Fig. 1 Planned Configuration of PV system

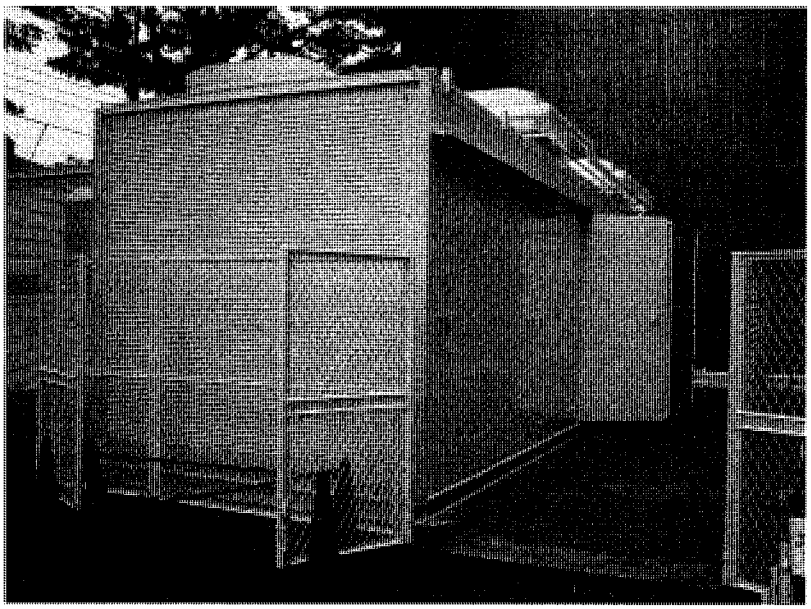
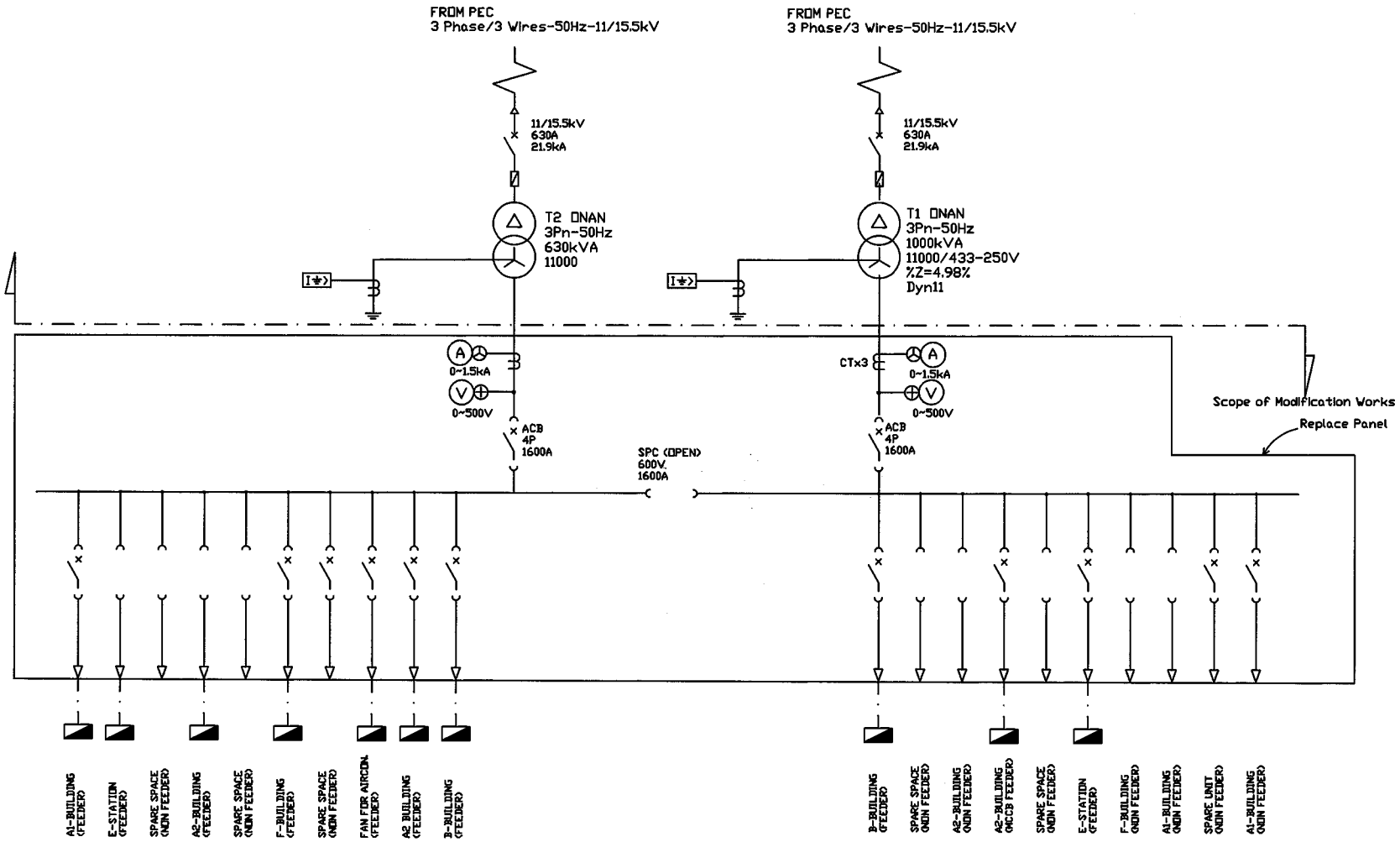
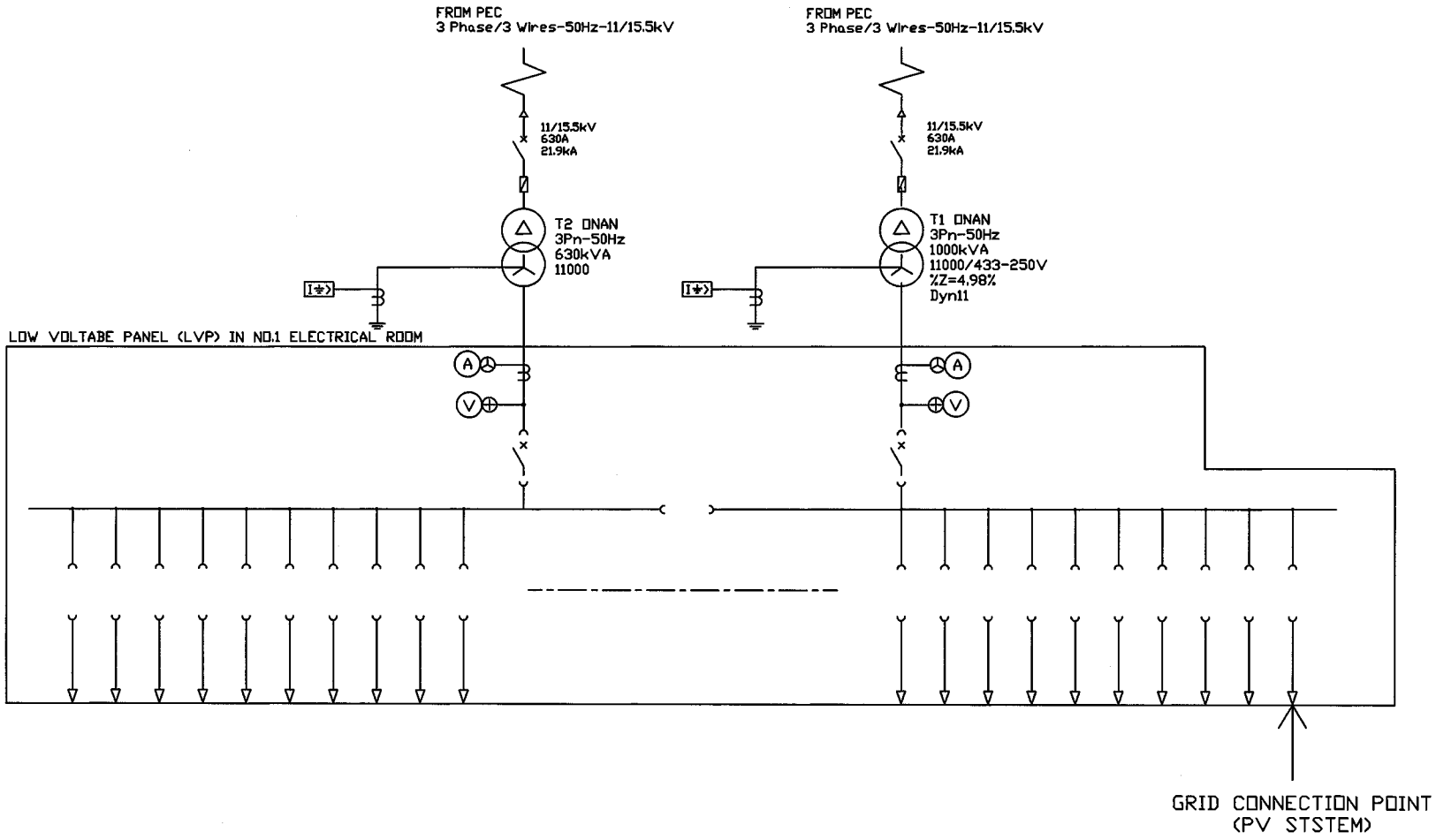


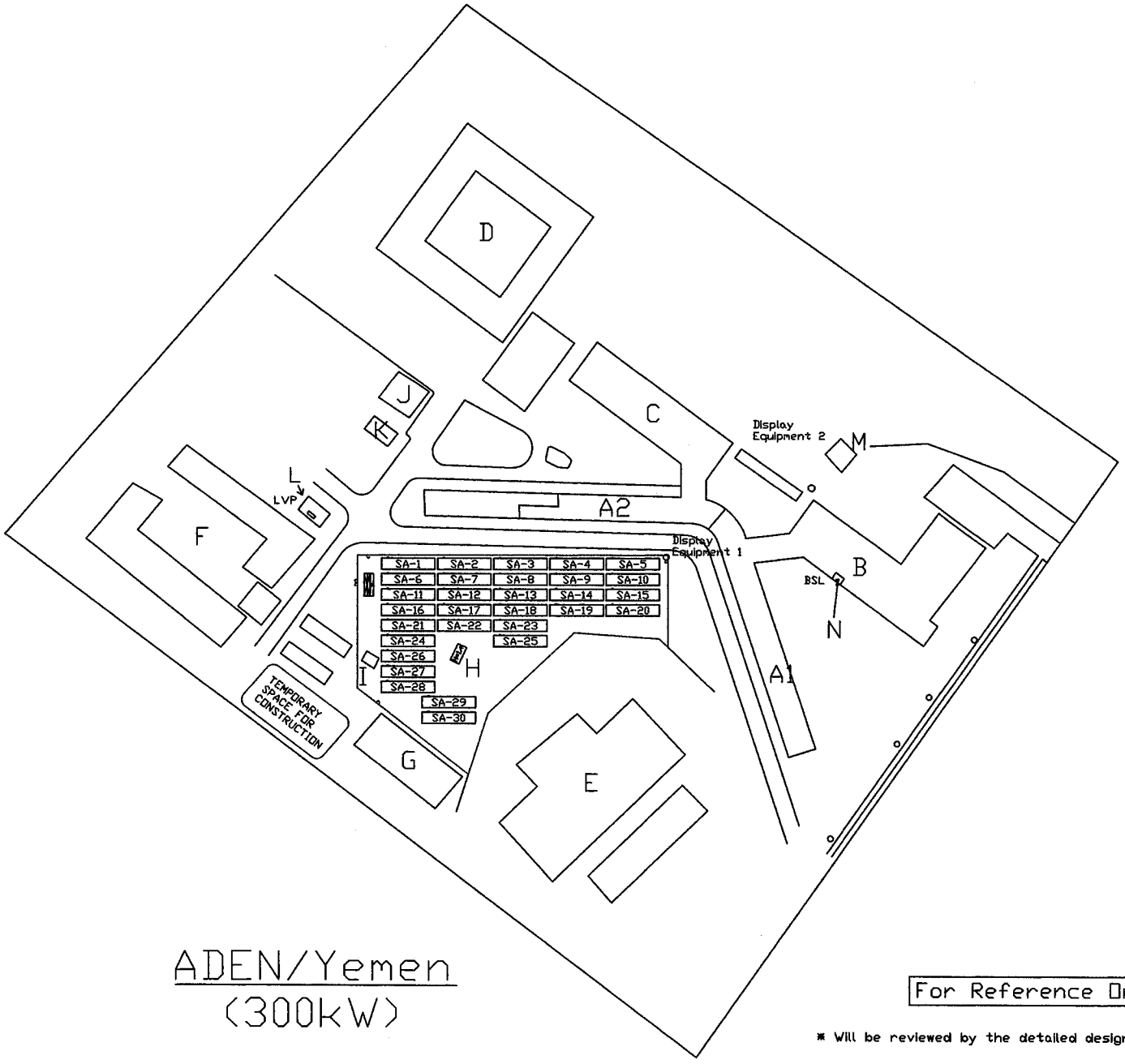
Fig.2 Example of Electrical Facility Cubicle of the PV system



Project for Introduction Of Clean Energy using Photovoltaic Power		
TITLE : SINGLE LINE DIAGRAM (EXISTING NO. 1 ELECTRIC ROOM)		
DRAWING NO. YE-01		Rev.1
DATE	DRAWN	CHECKED
SCALE: Non.(A3) Unit:		
NEWJEC	NEWJEC Inc. Osaka, JAPAN	



Project for Introduction Of Clean Energy using Photovoltaic Power		
TITLE : SINGLE LINE DIAGRAM (GRID CONNECTION POINT)		
DRAWING NO. YE-02		Rev.1
DATE	DRAWN	CHECKED
SCALE: Non.(A3) Unitmm		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	



A1: MAIN HOSPITAL WARD,7F (PEDIATIC)
A2: MAIN HOSPITAL WARD,7F
(PEDIATIC,UNDER RENOVATION)
B: ADMINISTRATION
C: ADMINISTRATION
D: GYNECOLOGY SECTION,5F (産婦人科)
E: KIDNEY DIALICS,2F (腎臓透析)
F: MAINTENANCE ROOM,1F
G: STOREHOUSE
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5M)
J: EXISTING NO.2 ELECTRIC ROOM (500KW DG)
K: EXISTING NO.3 ELECTRIC ROOM (NOT USE)
L: EXISTING NO.1 ELECTRIC ROOM (T1,T2)
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

: ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM [E.C.FOR PV]

: SUB ARRAY(10kW) [SA]

: DISPLAY EQUIPMENT
: POWER COLLECTION BOX [P.C.B.]
: TRANSDUCER BOX FOR METEOROLOGICAL OBSERVATION [T.D. BOX]

LVP:LOW VOLTAGE PANEL IN EXISTING ELECTRICAL ROOM 1
BSL:BRANCH SWITCHERS FOR LOAD IN BUILDING B

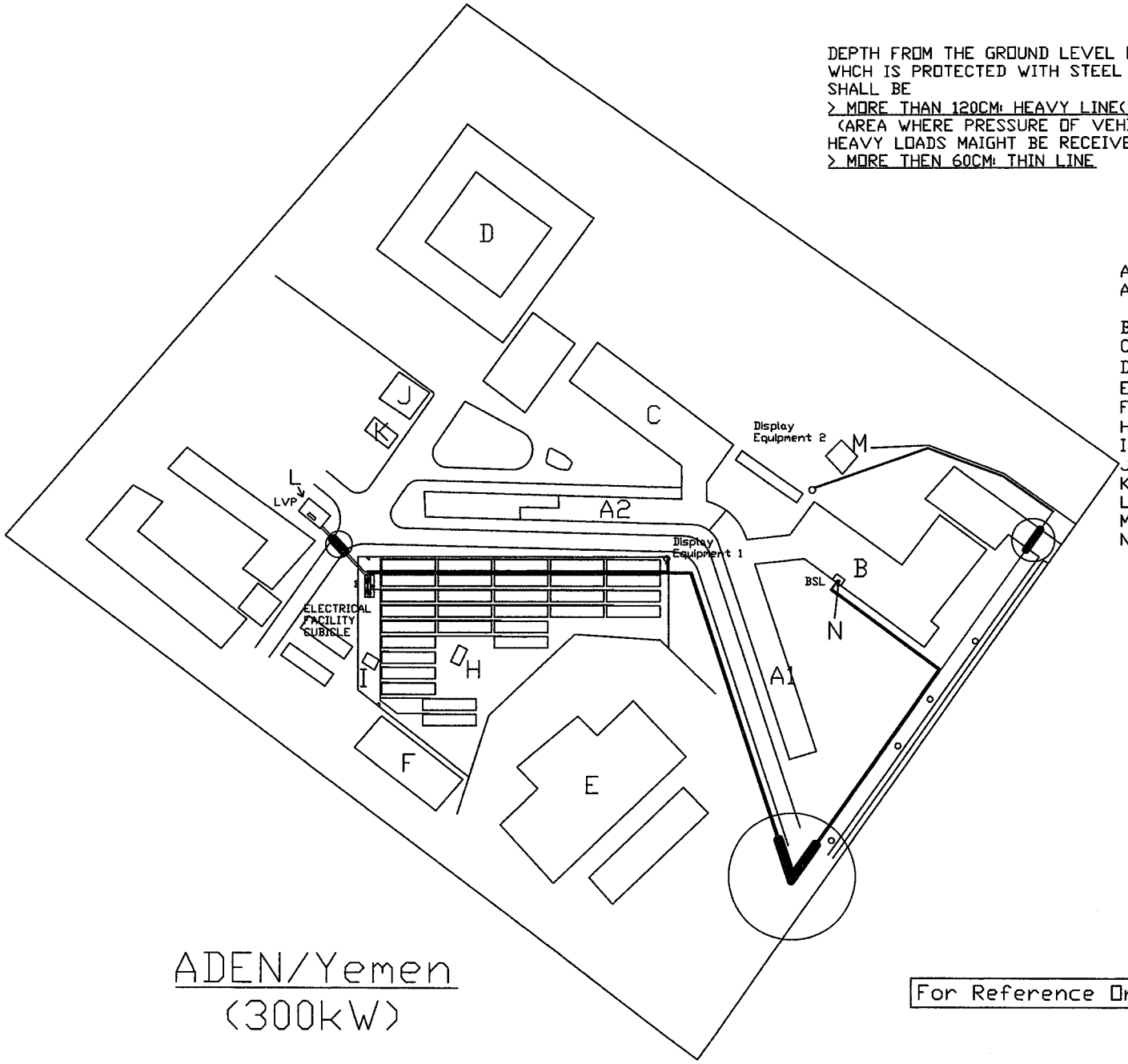
: FENCE
: GATE

ADEN/Yemen
(300kW)

For Reference Only

* Will be reviewed by the detailed design result, if necessary.

Project for Introduction Of Clean Energy using Photovoltaic Power		
TITLE : GENERAL LAYOUT PLAN		
DRAWING NO. YE-04		Rev.1
DATE	DRAWN	CHECKED
SCALE: ---- Unless		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	



DEPTH FROM THE GROUND LEVEL OF THE CABLE WHCH IS PROTECTED WITH STEEL STRIP IN COIL SHALL BE
> MORE THAN 120CM: HEAVY LINE(O)
(AREA WHERE PRESSURE OF VEHICLE AND OTHER HEAVY LOADS MAIGHT BE RECEIVED)
> MORE THEN 60CM: THIN LINE

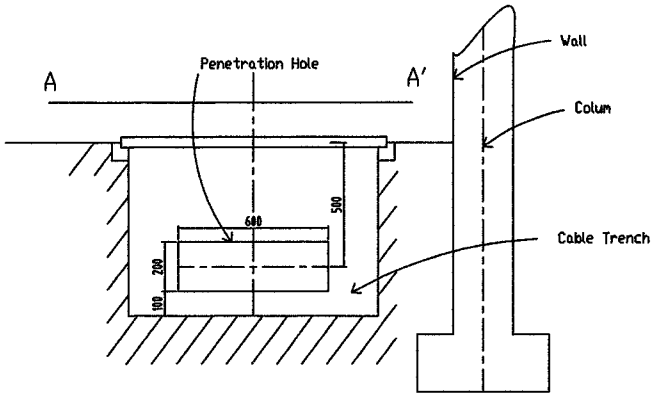
A1: MAIN HOSPITAL WARD,7F (PEDIATIC)
A2: MAIN HOSPITAL WARD,7F (PEDIATIC,UNDER RENOVATION)
B: ADMINISTRATION
C: ADMINISTRATION
D: GYNECOLOGY SECTION (産婦人科)
E: KIDNEY DIALICS,2F (腎臓透析)
F: MAINTENANCE ROOM,1F
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5M)
J: EXISTING NO.2 ELECTRIC ROOM (500KW DG)
K: EXISTING NO.3 ELECTRIC ROOM (NOT USE)
L: EXISTING NO.1 ELECTRIC ROOM (T1,T2)
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

LVP:LOW VOLTAGE PANEL IN EXISTING ELECTRICAL ROOM 1
BSL:BRANCH SWITCHERS FOR LOAD IN BUILDING B

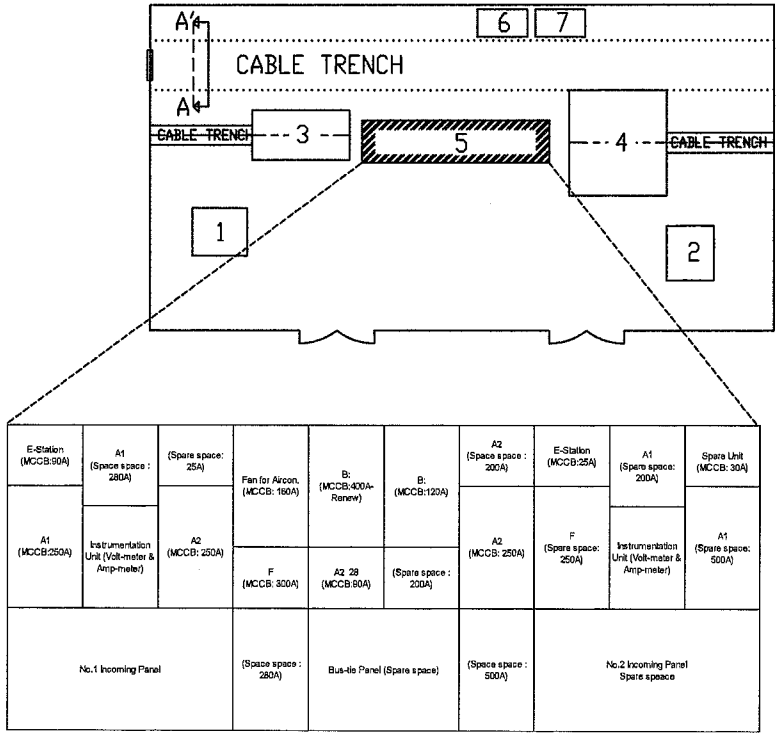
ADEN/Yemen
(300kW)

For Reference Only

Project for Introduction Of Clean Energy using Photovoltaic Power			
TITLE : CABLE LAYOUT PLAN (OUTSIDE)			
DRAWING NO. YE-12			Rev.1
DATE		DRAWN	CHECKED
SCALE: ----	Unit:mm		
NEWJEC	NEWJEC Inc. Osaka, JAPAN		



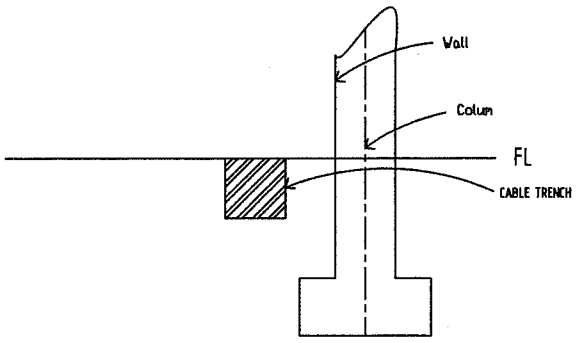
DETAILED PENETRATION HOLE
(A~A' SECTION)



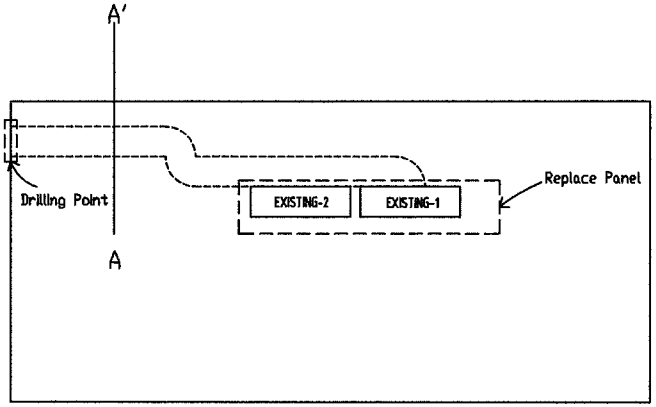
: Replace Panel

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT				REMARKS
			UNIT	WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
1	No.1 Power Receiving Unit	11kV Switchgear Unit	1	1,100	950	1,550	580	
2	No.2 Power Receiving Unit	11kV Switchgear Unit	1	1,100	950	1,550	580	
3	No.1 Distribution Transformer	3Ph-630kVA-11/0.4kV-50Hz-5.15%z-ONAN-Dyn11, CCCP	1	1,950	1,000	1,950	3,320	
4	No.2 Distribution Transformer	3Ph-1000kVA-11/0.433kV-0.25kV,4.86%z-ONAN-Dyn11, KOREA	1	1,950	2,100	1,950	3,100	
5	L/V Distribution	AC460V-Multi stage type MCC-CCCP	10	375	850	1,950	2,000	
6	Metering Pit	Wall mounting type	2	500	600	200	20	
7	Lighting Distribution Board	Wall mounting type	1	400	400	250	30	

	PROJECT TITLE	DRAWING TITLE	Scale :	Designed by	Checked by	Approved by	Date :
		EQUIPMENTS LAYOUT&MODIFICATION (EXISTING NO. 1 ELECTRIC ROOM)	1 : 100 (A3)				
			Date: 07.JULY.2008	Draftman	Drawing No. YE - 15		Edition / Sheet

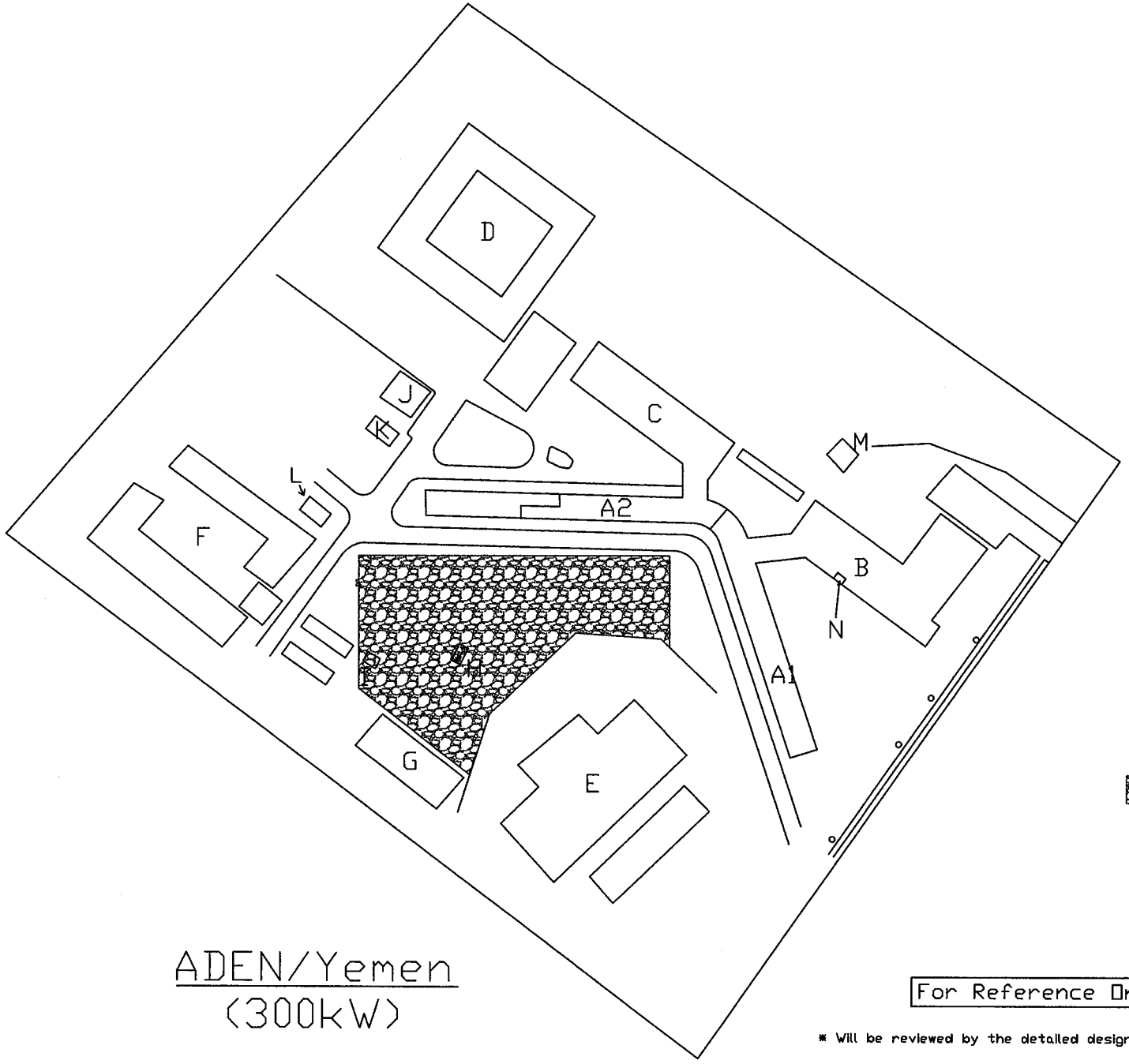


DETAILED PENETRATION HOLE
(A-A' SECTION)



No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT				REMARKS
			UNIT	WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
1	LOW VOLTAGE DISTRIBUTION BOARD-1	Metal-enclosed, wall mounting type consisting of molded case circuit breaker feeder circuits	1	1,000	300	2,350	80	Existing Panel
2	LOW VOLTAGE DISTRIBUTION BOARD-2	Metal-enclosed, wall mounting type consisting of molded case circuit breaker feeder circuits	1	1,000	300	2,350	80	Existing Panel

	PROJECT TITLE	DRAWING TITLE	Scale :	Designed by	Checked by	Approved by	Date :	
		EQUIPMENTS LAYOUT&MODIFICATION (BUILDING B ELECTRIC ROOM)	1 : 100 (A3)					
			Date: 07.JULY.2008	Draftman	Drawing No. YE - 16		Edition	Sheet



A1: MAIN HOSPITAL WARD,7F (PEDIATIC)
A2: MAIN HOSPITAL WARD,7F
(PEDIATIC,UNDER RENOVATION)
B: ADMINISTRATION
C: ADMINISTRATION
D: GYNECOLOGY SECTION,5F (産婦人科)
E: KIDNEY DIALICS,2F (腎臓透析)
F: MAINTENANCE ROOM,1F
G: STOREHOUSE
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5M)
J: EXISTING NO.2 ELECTRIC ROOM (500KW DG)
K: EXISTING NO.3 ELECTRIC ROOM (NOT USE)
L: EXISTING NO.1 ELECTRIC ROOM (T1,T2)
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

: PAVING STONE
(t=10 cm)

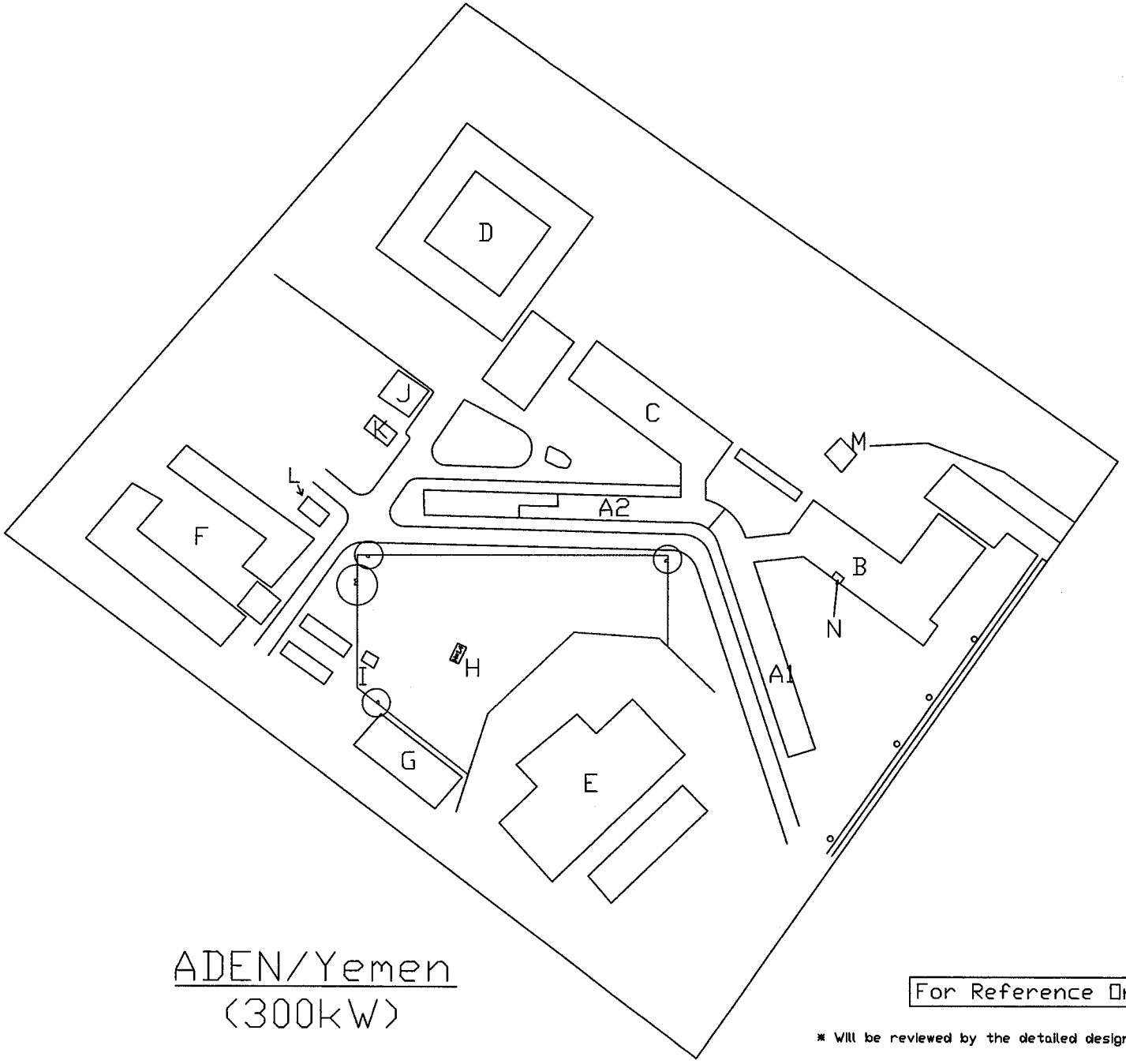
: FENCE
: GATE

ADEN/Yemen
(300kW)

For Reference Only

* Will be reviewed by the detailed design result, if necessary.

Project for Introduction Of Clean Energy using Photovoltaic Power		
TITLE : PAVING STONE PLAN		
DRAWING NO. YE-10		Rev.1
DATE	DRAWN	CHECKED
SCALE: ---- Unless		
NEWJEC	NEWJEC Inc. Osaka, JAPAN	



A1: MAIN HOSPITAL WARD,7F (PEDIATIC)
A2: MAIN HOSPITAL WARD,7F
(PEDIATIC,UNDER RENOVATION)
B: ADMINISTRATION
C: ADMINISTRATION
D: GYNECOLOGY SECTION,5F (産婦人科)
E: KIDNEY DIALICS,2F (腎臓透析)
F: MAINTENANCE ROOM,1F
G: STOREHOUSE
H: WATER TANK(UNDERGROUND)
I: WATER TANK (H=5M)
J: EXISTING NO.2 ELECTRIC ROOM (500KW DG)
K: EXISTING NO.3 ELECTRIC ROOM (NOT USE)
L: EXISTING NO.1 ELECTRIC ROOM (T1,T2)
M: COFFEE SHOP
N: ELECTRICAL ROOM FOR BUILDING B

: FENCE
: GATE

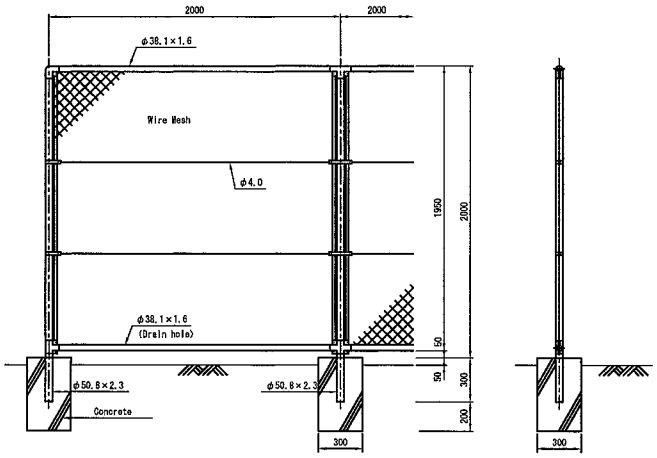
ADEN/Yemen
(300kW)

For Reference Only

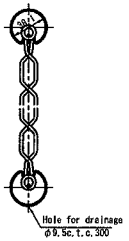
* Will be reviewed by the detailed design result, if necessary.

Project for Introduction Of Clean Energy using Photovoltaic Power		
TITLE : LAYOUT OF FENCE AND GATE		
DRAWING NO. YE-19		Rev.1
DATE	DRAWN	CHECKED
SCALE: ---- Unitm		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	

PC−A2000 S=1:20



Cross Section of Fence S=1:3

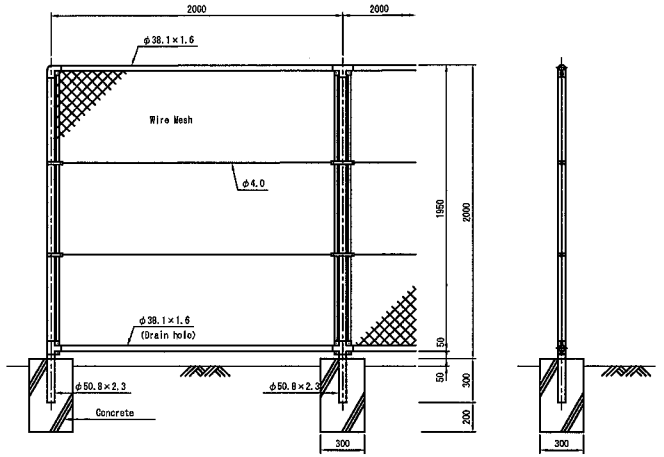


Note
・Paint ・・・ Zinc hot dipping covered by rust proof paint
Washer: zinc hot dipping only

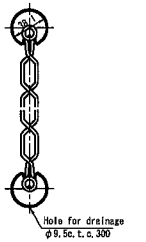
YE-20 FENCE,GATE(DETAIL)
[NON SCALE]

PC−A2000 S=1:20

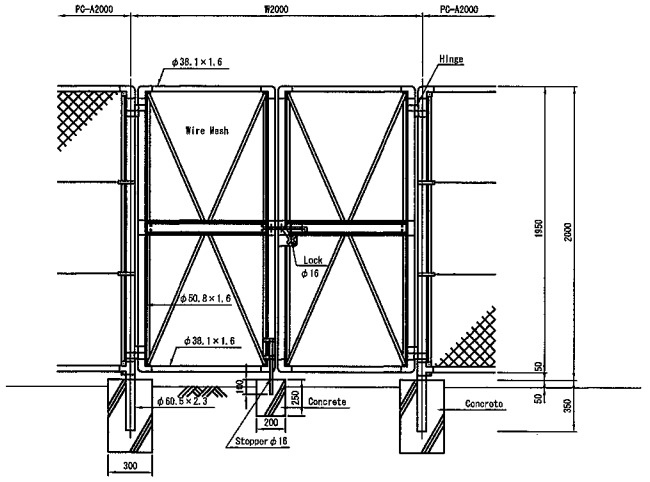
Note
・Paint ・・・ Zinc hot dipping covered by rust proof paint
Washer: zinc hot dipping only



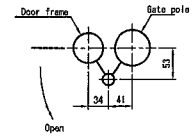
Cross Section of Fence S=1:3



PC Gate H2000×W2000 S=1:20

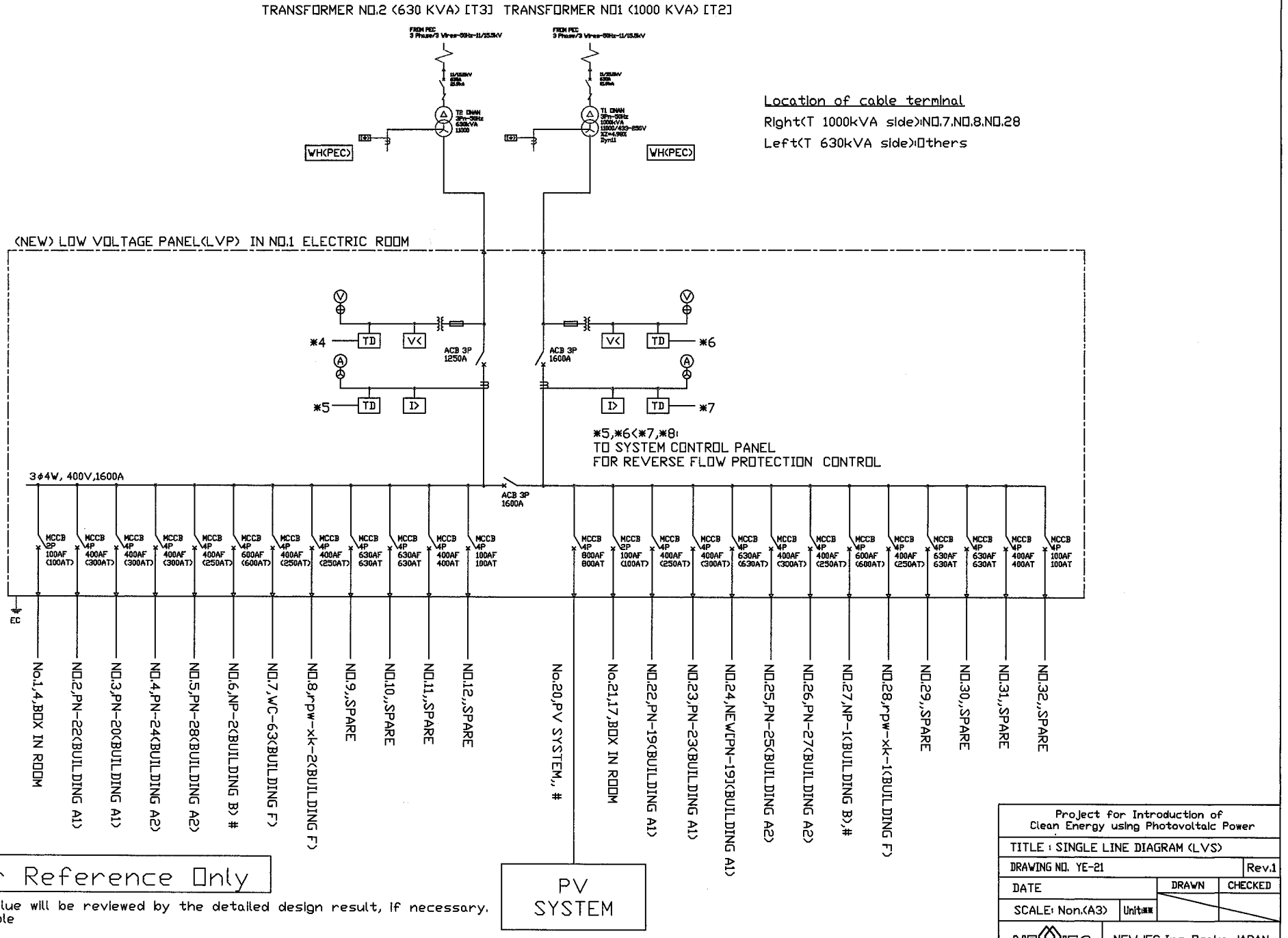


Detail of Gate pole・Door frame



Note
・Paint ・・・ Zinc hot dipping covered by rust pr
Washer: zinc hot dipping only
・The maximum angle of Gate Opening : 180°

Attachment -2



For Reference Only

* The value will be reviewed by the detailed design result, if necessary.
# New cable

Project for Introduction of Clean Energy using Photovoltaic Power			
TITLE : SINGLE LINE DIAGRAM (LVS)			
DRAWING NO. YE-21			Rev.1
DATE		DRAWN	CHECKED
SCALE: Non.(A3)	Unit:		
NEWJEC	NEWJEC Inc. Osaka,JAPAN		

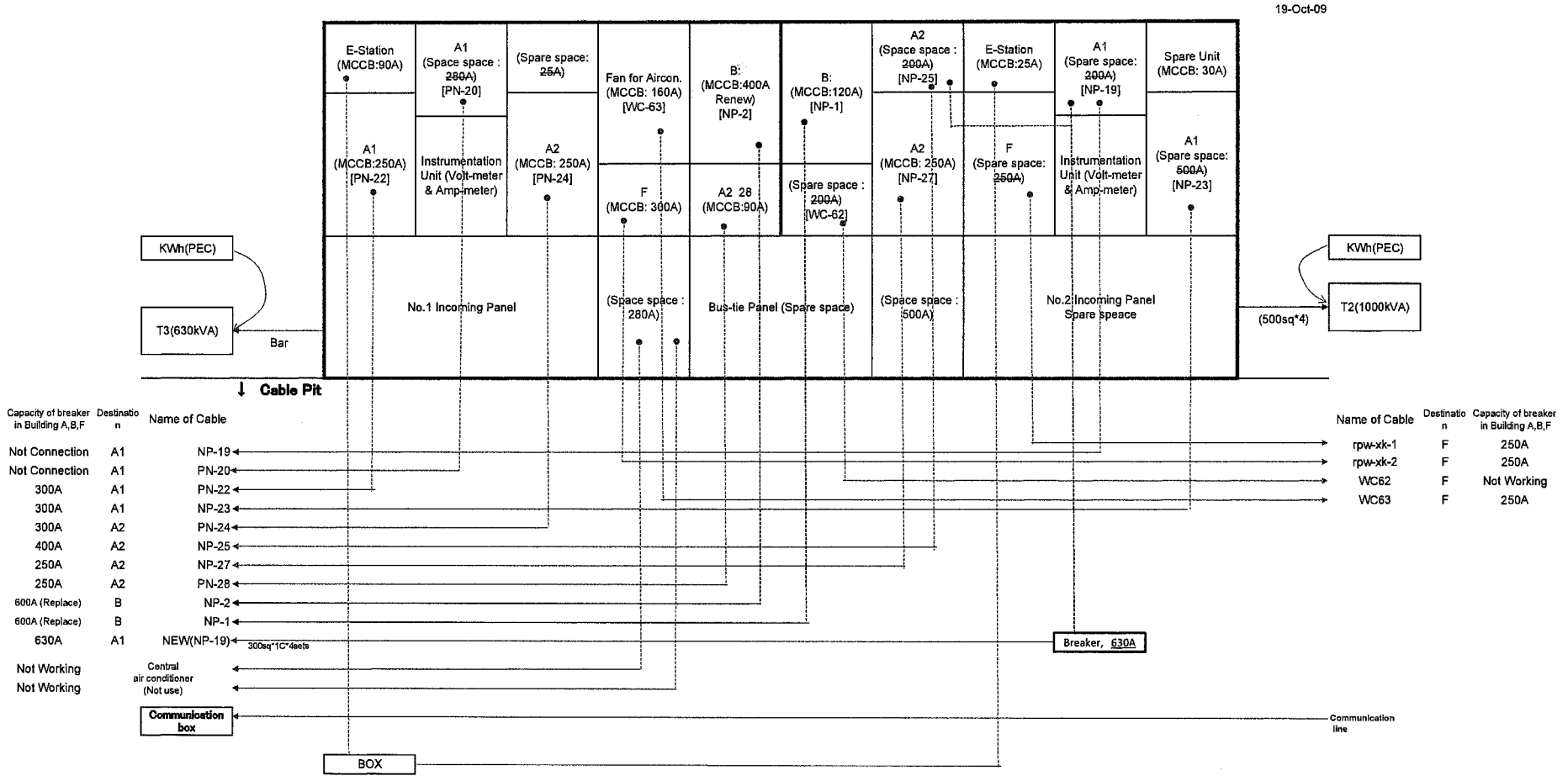
Capacity of Breakers of Low Voltage Panel(LVP) in No.1 Electrical Room

19-Oct-09

No.	Name of cable	From	To	EXISTING SYSTEM					NEW SYSTEM				
				Number of cable/core	Working / Not Working	Remarks	Capacity of breaker in Low Voltage Panel	Capacity of breaker in Building A,B,F	No,	Capacity of breaker in NEW Low Voltage Panel	Cables	Cable Terminal in LVP	Remaks
1	4	T3	BOX IN ROOM	2 core	working	IN HOUSE USE	90A	-	1	100A	Not replace	Left (T 630kVA side)	
2	PN-22	T3	Building A1	4 core	working		250A	300A	2	300A	Not replace	Left (T 630kVA side)	
3	PN-20	T3	Building A1	4 core	working		(280A)	-	3	300A	Not replace	Left (T 630kVA side)	
4	PN-24	T3	Building A2	4 core	working		250A	300A	4	300A	Not replace	Left (T 630kVA side)	
5	PN-28	T3	Building A2	4 core	working		90A	250A	5	250A	Not replace	Left (T 630kVA side)	
6	NP-2	T3	Building B	4 core	working	NEW BREAKER	400A		6	**600A**	**Replace**	Left (T 630kVA side)	
7	WC-63	T3	**Building F**	4 core	working		160A	250A	7	250A	Not replace	Right (T 1000kVA side)	
8	rpw-xk-2	T3	**Building F**	4 core	working			250A	8	250A	Not replace	Right (T 1000kVA side)	
9	17	T2	BOX IN ROOM	2 core	working	IN HOUSE USE	25A	-	21	25A	Not replace	Left (T 630kVA side)	
10	NP-19	T2	Building A1	4 core	working			-	22	250A	Not replace	Left (T 630kVA side)	
11	NP-23	T2	Building A1	4 core	working		(500A)	300A	23	400A	Not replace	Left (T 630kVA side)	
12	NEW (NP-19)	T2	Building A1	1 core*4	working	NEW CABLE 300sq	630A	630A	24	630A	Not replace	Left (T 630kVA side)	
13	PN-25	T2	Building A2	4 core	working		(200A)	400A	25	400A	Not replace	Left (T 630kVA side)	
14	PN-27	T2	Building A2	4 core	working		250A	250A	26	250A	Not replace	Left (T 630kVA side)	
15	NP-1	T2	Building B	4 core	working		120A		27	**600A**	**Replace**	Left (T 630kVA side)	
16	rpw-xk-1	T2	**Building F**	4 core	working			250A	28	250A	Not replace	Right (T 1000kVA side)	
	cy-3	T3	Central Air Conditioner	4 core*2	Not working		-	-		-			Not connection
	WC-62	T2	Building F	4 core	Not working		(200)						Not connection
	2	No cable					-	-					No cable
	19	No cable					-	-					No cable
	20	Nocable					-	-					No cable

Souse: Material from Hospital (18 Oct. 2009)

Low Voltage Panel in No.1 Electrical Room



RED LINE : Removal

List of load in Building B (administration)

18 October, 2009

Name	Light	Air conditioner	X-ray1	X-ray2	Fans	Refrigerator		Computer	Device of dental clinic
Capacity	80W	10A	100A,3ph	60A,3ph	100W	1.5A	6A	?	?
Number of load(s)	200	57	1	1	70	14	4	10	2
Operating day/hours	8:00-13:00	8:00-13:00	24 hour shand-by	24 hour shand-by	8:00-13:00	24 hour	8:00-13:00	8:00-13:00	8:00-13:00
Remarks									

Source : Material by Hospital (18 Oct.2009)

REPUBLIC OF YEMEN
Ministry of Water and Environment
Environment Protection Authority

بسم الله الرحمن الرحيم

الجمهورية اليمنية
وزارة المياه والبيئة
الهيئة العامة لحماية البيئة

No/Ref: ..... الرقم / المرجع: ٤ ٧ ٩٥ ص ح ب

Date: ..... التاريخ: ١١/ ١٧/ ٢٠٠٩م

No.of Pages: ..... عدد المرفقات: ٢

Mr. Shoji Takamatsu
In charge of Environmental and social consideration
JICA Preparatory survey team

Subject: The Project for Clean Energy Promotion using Solar Photovoltaic System in the Republic of Yemen

Dear Sir

With reference to the above mentioned subject and the screening procedure for environmental and social consideration about the project mentioned in your letter. We would like to inform you that we agree to your opinion which is in accordance with Yemen and JICA`s guideline for Environmental and Social Consideration.

Best Regards

Mahmoud M.Shidiwah

Chairman
Environmental protection Authority
Ministry of Water &Environment
Republic of Yemen

صنعاء - ص.ب : (١٩٧١٩)-هاتف: ٧/ ٢٠٧٨١٦ - فاكس : ٢٠٧٣٢٧ بريد إلكتروني : epa-yemen@yemen.net.ye
Sana'a - P.O.Box: (19719) - Tel: (207816/7) - Fax: (207327) - E-mail:epa-yemen@yemen.net.ye
www.yemenenvironment.org الموقع الإلكتروني