

The Afghanistan Engineering Support Program assembled this deliverable. It is an approved, official USAID document. Budget information contained herein is for illustrative purposes. All policy, personal, financial, and procurement sensitive information has been removed. Additional information on the report can be obtained from Firouz Rooyani, Tetra Tech Sr. VP International Operations, (703) 387-2151.

To: [REDACTED]

Cc: [REDACTED]

From: [REDACTED] PE BCEE

Date: November 21, 2015

Subject: WO-LT-0083 AMD 3, Deliverable for Task 2, DABS Self-Perform Schedule Development

This memorandum is presented for the fulfillment of Work Order WO-LT-0083 Amendment 3, Task 2. Notice to Proceed (NTP) for this Amendment was received on October 31, 2015.

EXECUTIVE SUMMARY

The objectives of this task are as follows.

1. Assist DABS in the development of a schedule to self-perform the design, procurement and installation of a proposed new 20 kV line from the proposed solar photovoltaic (SPV) plant to the existing Kandahar Breshna Kot Substation (BKT).
2. Assist DABS in the evaluation of their in-house capabilities and capacity to perform the referenced work and support DABS in the establishment of an achievable implementation schedule for this line.
3. Review the design of the subject 20 kV distribution feeder.

The Gantt chart is in Appendix A.

Having reviewed the project to construct the 16 km 20kV distribution feeder from the existing BKT Substation to the future SPV plant, Tetra Tech believes DABS can self-perform the construction the feeder according to the schedule.

The design of the distribution feeders in Afghanistan is by the Ministry of Energy and Water. Tetra Tech recommends at least 245mm² conductor. Presently, there is no standard design by MEW for a double circuit 245mm² 20kV distribution feeder. This change to use a large wire size will reduce technical losses (Dollars, kWh, energy) and will reduce voltage drop are reduced. It will begin working with DABS and MEW on the needed design for the double-circuit 245mm² 20kV feeder. Procurement of materials by DABS is several months away and so this is not considered a critical path task.

Objective

Task 2 presupposes the dedicated new 16 km 20 kV transmission line is the preferred connection alternative between the proposed SPV plant and BK.

It is to assist DABS in the development of a schedule to self-perform the design, procurement and installation of a proposed new 20 kV line from the proposed SPV plant to the BKT substation. Tt AESP will assist DABS in the evaluation of their in-house capabilities and capacity to perform the referenced work and support DABS in the establishment of an achievable implementation schedule for this line.

Tt AESP also reviewed the design of the subject 20 kV distribution feeder, to be completed by DABS, and is to monitor the construction of the feeder for quality assurance during the construction phase¹. This technical memorandum only covers the review of the design since construction is in the future.

Task 2 Deliverable: Schedule for the design, procurement and installation of the proposed 20 kV distribution feeder, in either MS Project or Primavera, format to be determined. This schedule shall be prepared for presentation during the anticipated pre-bid meeting in November 2015.

Schedule

Tetra Tech worked with DABS personnel in Kabul and in Kandahar about the schedule for DABS to self-perform the construction of the dedicated 20kV feeder from the future SPV to the existing Kandahar Breshna Kot Substation (BKT). DABS Kabul deferred to DABS Kandahar for the development of the schedule.

DABS Kandahar is confident that the dedicated 16 km feeder between BKT and SPV can be constructed in 75 working days from notice to proceed along the right of way on the north side of the irrigation canal. See Appendix A for a Gantt chart.

March 16, 2015 was arbitrarily chosen as the start date on the Gantt chart in Appendix A. The important aspect of the schedule is that DABS plans to finish all the work in 75 working days. The schedule includes provision for two days off per week by DABS. Hence the end is June 28, 2016 for March 16, 2015 start date; this is 104 calendar days.

Evaluation of DABS In-House Capabilities and Capacity

DABS Kandahar reports constructing the following distribution line projects in the past three calendar years.

Table 1 – DABS Kandahar Distribution Line Projects (last three calendar years)

Year	Number of 20kV Circuits Planned	Total Length Planned (km)	Number of Construction Projects Not Finished as Planned
DABS Kandahar			
2013, 2014, and 2015	12 double circuit feeder	270 km ² double-circuit (that is, 540 circuit-km)	All projects in 2013 and 2014 were completed as planned. As of mid-November 2015, DABS Kandahar expects to complete the projects planned for 2015.

¹ *Task 2 Special Note:* When DABS completes their design and implementation plan for construction of the new, dedicated 20 kV transmission line, Tt AESP will monitor the construction of the line for quality assurance under work order WO-LT-0092 Construction Management and Quality Assurance Services.

² The exact lengths of each feeder were not known at the time of report preparation. However, DABS was sure that some feeders are 30 km long and other feeders are 15 km long. Tt assumed 6x30km feeders plus 6x15km feeders, for a total of 270km.

DABS Kandahar has the following construction vehicles at their disposal to construct the subject double-circuited 20kV distribution feeders. No trucks are listed; the bucket trucks, cranes and borer are used in place of trucks.

1. Two bucket trucks, used to install cross-arms and conductors.
2. Two cranes, used to lift and place poles.
3. Two borers / drills, used to dig the holes for the poles.
4. One warehouses at Kandahar with material and to receive material.
5. One storage yard at Kandahar with material and to receive material.
6. 25 linemen.

Twenty (20) days are allocated for installing the poles. Installation and stringing is done in a pipelined fashion. There are 330 poles to be installed (= 16500 m / 50 m per span). The installation rate has to be 16.5 poles per day on average (= 330 / 20). Estimating that a crew can install four poles per day, this means that four crews are needed. Each crew consists of seven workers. Each crew needs to have a full team of workers and the needed equipment (borer, crane, trucks, etc.).

Tetra Tech is confident that DABS can self-perform the subject project in the time allotted. To secure the on-time completion a risk assessment has been prepared. See Appendix C.

Review of the Design of the Line

MEW provides the distribution design book that DABS uses. Some indicative, illustrative drawings and specifications of feeders that are not double-circuit 245mm² are in Appendix C. Tetra Tech will work with DABS and MEW to develop the new design standards for a double-circuit 245mm² 20kV feeder. This is not considered to be a critical path item since the design work starts now and is to be completed well before DABS procurement begins.

Tetra Tech recommends that a large conductor (for example, 245 mm²) conductor be used to reduce technical (energy) losses and to reduce voltage drop between the new SPV plant and the BKT Substation.

APPENDICES

APPENDIX A GANTT CHART

The start date of March 16, 2016 was arbitrarily chosen. The key point is that the work is to be completed in 75 working days. The chart below includes two days off per week as non-work days. That is, the schedule is 75 workdays, which is 104 calendar days. The end date is June 28, 2016.



ID	Task Name	Duration	Start	Finish	Qtr 1, 2016												Qtr 2, 2016				
					March				April				May				June				July
					3/6	3/13	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	5/15	5/22	5/29	6/5	6/12	6/19	6/26
0	LT-0083 AMD3 KANDAHAR SOLAR TRANSACTIONS ASSISTANCE	75 days	Wed 3/16/16	Tue 6/28/16	3/16 ————— 6/28																
1	MILESTONES	75 days	Wed 3/16/16	Tue 6/28/16	3/16 ————— 6/28																
2	Notice to Proceed	0 days	Wed 3/16/16	Wed 3/16/16	◆ 3/16																
3	Project Completion	0 days	Tue 6/28/16	Tue 6/28/16	◆ 6/28																
4	OPTION-2: NEW 16KM 20 KV TRANSMISSION LINE BETWEEN SOLAR PHOTOVOLTAIC (SPV) & BRESHNA KOT (BK)	75 days	Wed 3/16/16	Tue 6/28/16	3/16 ————— 6/28																
5	PRE-CONSTRUCTION, ENGINEERING AND DESIGN	30 days	Wed 3/16/16	Tue 4/26/16	3/16 ————— 4/26																
6	RoW, Site Survey and Soil Investigation	15 days	Wed 3/16/16	Tue 4/5/16	3/16 ————— 4/5																
7	Land Acquisition and Resettlement (LAR)	15 days	Wed 4/6/16	Tue 4/26/16	4/6 ————— 4/26																
8	Finalize Designs for 245 sqmm Double Circuits	14 days	Wed 3/16/16	Mon 4/4/16	3/16 ————— 4/4																
9	PROCUREMENT	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
10	Manufacture and Delivery of Transmission Poles	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
11	Procure and Supply Conductors	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
12	Procure and Supply Insulators	15 days	Wed 4/27/16	Tue 5/17/16	4/27 ————— 5/17																
13	Procure and Supply Overhead Ground Wire	15 days	Wed 4/27/16	Tue 5/17/16	4/27 ————— 5/17																
14	Procure and Hardware Fittings and Accessories	15 days	Wed 4/27/16	Tue 5/17/16	4/27 ————— 5/17																
15	Procure and Supply Earthing Materials	15 days	Wed 4/27/16	Tue 5/17/16	4/27 ————— 5/17																
16	CONSTRUCTION	41 days	Wed 4/27/16	Wed 6/22/16	4/27 ————— 6/22																
17	POLES FOUNDATION AND EARTHING	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
18	Poles Foundation and Earthing (P0001-P0160)	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
19	Poles Foundation and Earthing (P0161-P0320)	20 days	Wed 4/27/16	Tue 5/24/16	4/27 ————— 5/24																
20	ERECTION, ASSEMBLY AND FOUNDATION GROUT	18 days	Wed 5/25/16	Sun 6/19/16	5/25 ————— 6/19																
21	Erection, Assembly and Foundation Grout (P0001-P0160)	18 days	Wed 5/25/16	Sun 6/19/16	5/25 ————— 6/19																
22	Erection, Assembly and Foundation Grout (P0161-P0320)	18 days	Wed 5/25/16	Sun 6/19/16	5/25 ————— 6/19																
23	INSTALL BRACKETS AND INSULATORS	13 days	Mon 6/6/16	Wed 6/22/16	6/6 ————— 6/22																
24	Install Brackets and Insulators Pole (P0001-P0160)	13 days	Mon 6/6/16	Wed 6/22/16	6/6 ————— 6/22																
25	Install Brackets and Insulators Pole (P0161-P0320)	13 days	Mon 6/6/16	Wed 6/22/16	6/6 ————— 6/22																
26	CONDUCTORS AND OVERHEAD GROUND WIRE AND ACCESSORIES	10 days	Sat 6/11/16	Wed 6/22/16	6/11 ————— 6/22																
27	Install Conductors and Overhead Ground Wire 0-8 KM	10 days	Sat 6/11/16	Wed 6/22/16	6/11 ————— 6/22																
28	Install Conductors and Overhead Ground Wire 8-16 KM	10 days	Sat 6/11/16	Wed 6/22/16	6/11 ————— 6/22																
29	CLOSE-OUT	4 days	Sat 6/25/16	Tue 6/28/16	6/25 ————— 6/28																
30	Checking, Testing and Commissioning	4 days	Sat 6/25/16	Tue 6/28/16	6/25 ————— 6/28																
31	Project Hand Over	0 days	Tue 6/28/16	Tue 6/28/16	◆ 6/28																

Task Summary Deadline Progress

Milestone Project Summary Critical

APPENDIX B
RISK ASSESSMENT

Risk Assessment

The following items are identified by Tetra Tech as risk items to be monitored. Detection criteria are presented, as well as mitigation measures that could be implemented if the risk becomes a reality.

1. Obtaining large conductor ACSR

- Risk: Purchasing and delivering to Kandahar by DBAS of the ACSR larger than 120mm².
- Detection: Weekly monitoring of the status of the procurement and shipment, with reports by DABS Procurement Department to DABS Head of Planning and Engineering.
- Mitigation: Borrow and replace ACSR of a comparable size from another project (USAID? USACE? DABS? Etc.) in Afghanistan and then replace the borrowed ACSR to the project that offered the ACSR.

2. Rights to Right of Way

- Risk: DABS will not obtain the rights to the right of way in time.
- Detection: Review the status with the LAR Manager weekly, and if the Manager is not able to obtain the legal documents for the right of way by the milestone set forth in the project schedule base line.
- Mitigation: The recently hired Land Acquisition and Resettlement manager at DABS will be involved from the beginning and will be engaged to resolve right of way access matters with landowners and the government. DABS can escalate the matter to the Ministry of Energy and Water for their action.

3. Weather

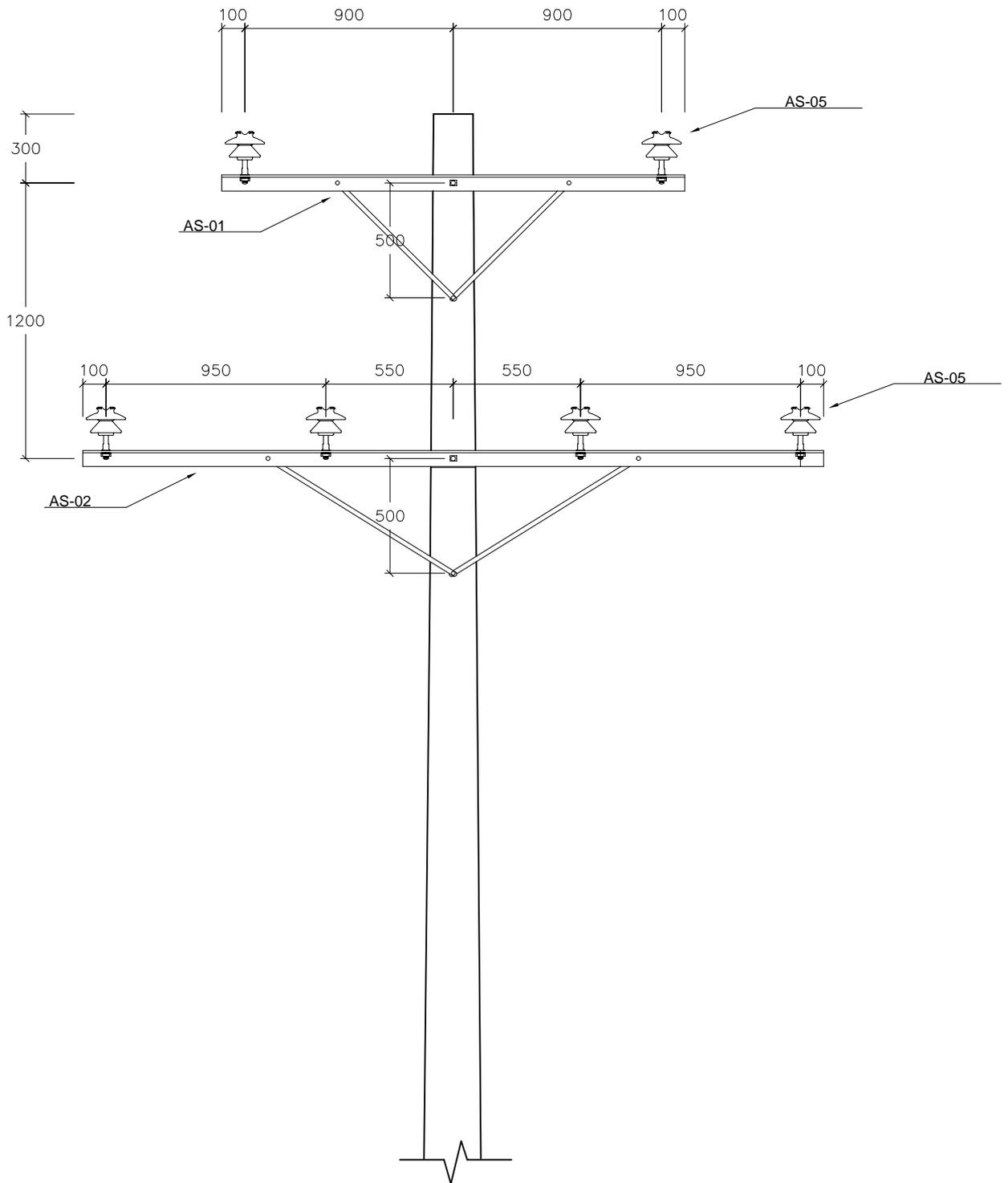
- Risk: Weather may delay construction.
- Detection: The milestones for construction in the Gantt chart are not met.
- Mitigation: DABS can work longer days, Work more days in a week. Provide extra pay or provide compensation time to the workers. Start construction as early as possible, not as late as possible. Hire temporary workers. Hire subcontractors. Bring in DABS workers from DABS zones (Helmand, Zabul, Kabul, etc.).

4. Construction

- Risk: Construction (digging, pole setting, installation of hardware, stringing, etc.) falls behind schedule.
- Detection: The milestones for construction in the Gantt chart are not met.
- Mitigation: DABS can work longer days, Work more days in a week. Provide extra pay or provide compensation time to the workers. Start construction as early as possible, not as late as possible. Hire temporary workers. Hire subcontractors. Bring in DABS workers from DABS zones (Helmand, Zabul, Kabul, etc.).

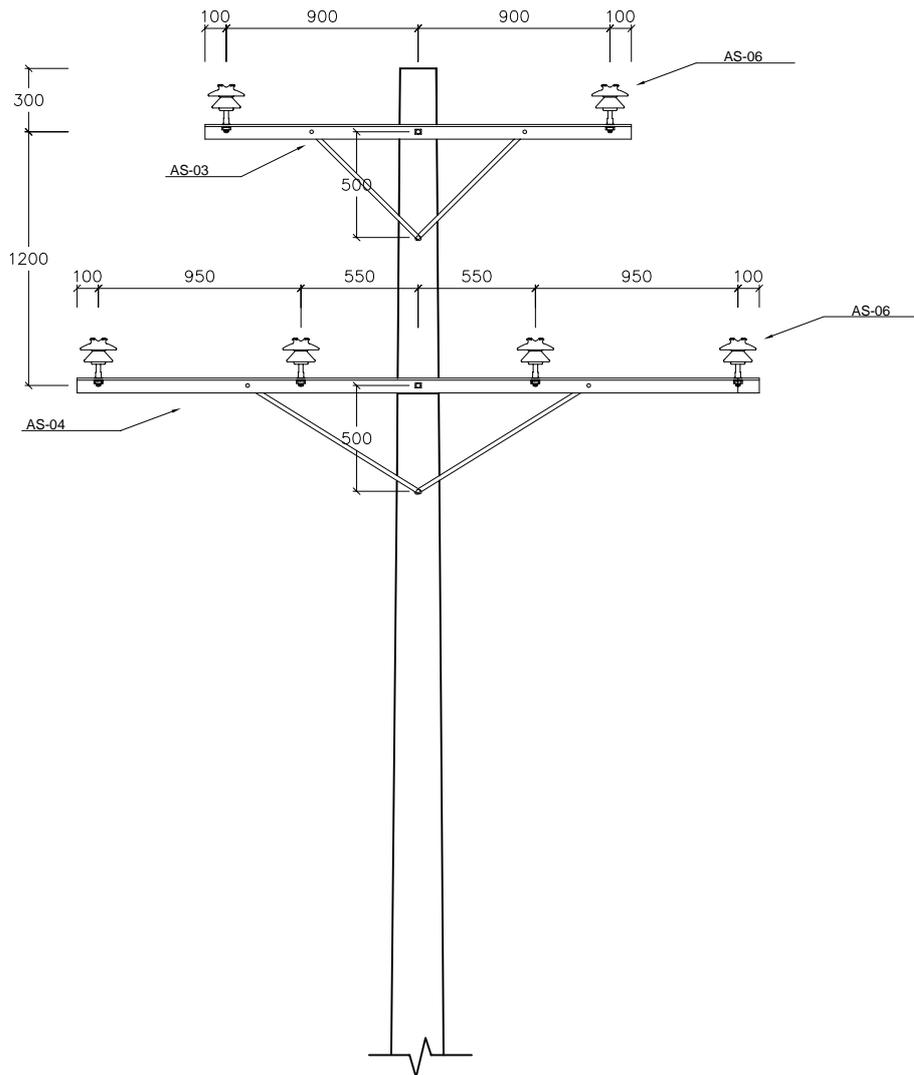
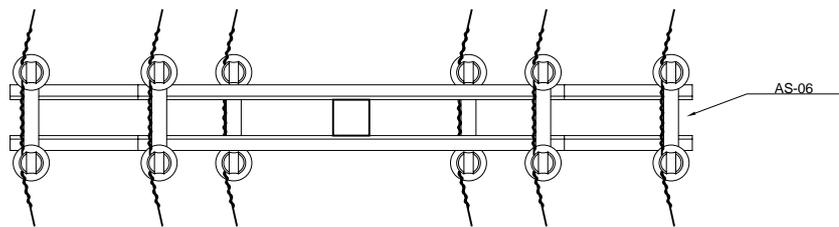
APPENDIX C DESIGN DRAWINGS

This appendix contains seven drawings from the distribution design standards. They will be reviewed and adjusted as needed for 245mm² conductors and sky wire.



Assembly	Qty.	Description	Material	Qty.	Description
AS-01	1	Single crossarm steel (2000 mm)			
AS-02	1	Single crossarm steel (3200 mm)		6	Preformed distribution ties for ACSR
AS-05	6	Single support on crossarm (tangent)			

 <p>Ministry of Water and Power decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH</p>		Single support on crossarm double circuit, MV			Drawing:
		Rehabilitation and Extension of Kabul City Distribution Network	Date: March, 2005	Revision: 2	Scale: Without



Assembly	Qty.	Description	Material	Qty.	Description
AS-03	1	Double crossarm steel (2000 mm)			
AS-04	1	Double crossarm steel (3200 mm)		12	Preformed distribution ties for ACSR
AS-06	6	Double support on crossarm (angle)			



Ministry of Water and Power
decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH



Rehabilitation and Extension of Kabul City
Distribution Network

Double support on crossarm (angle 5°-15°)
double circuit, MV

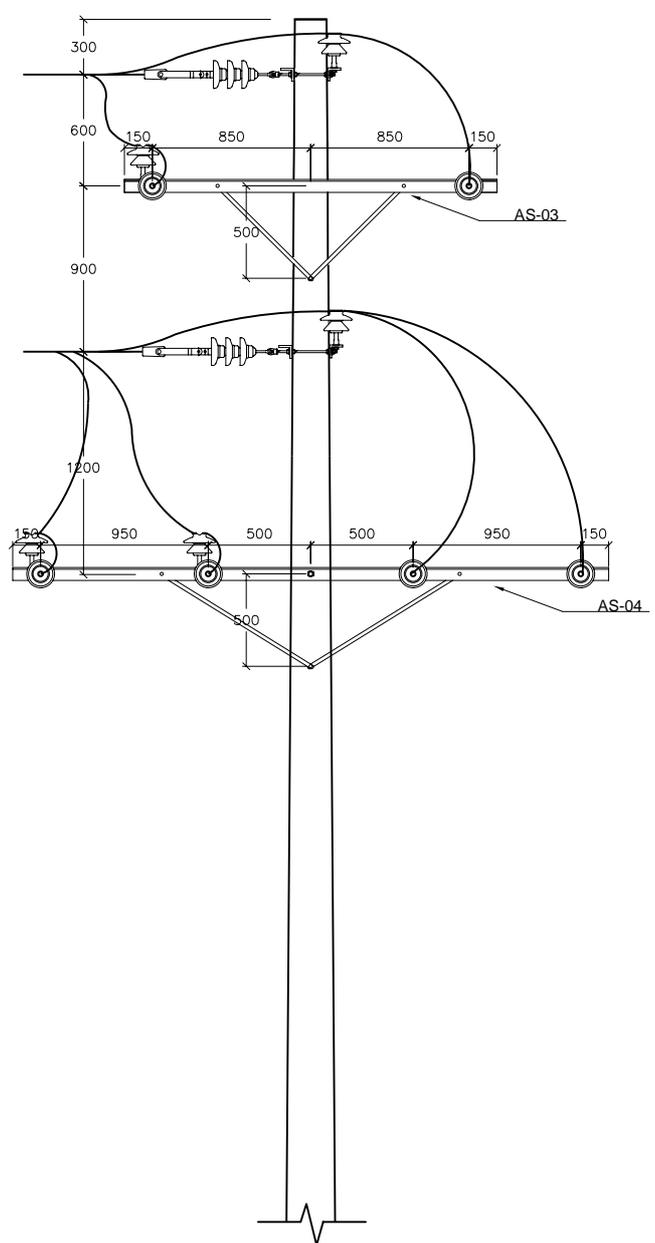
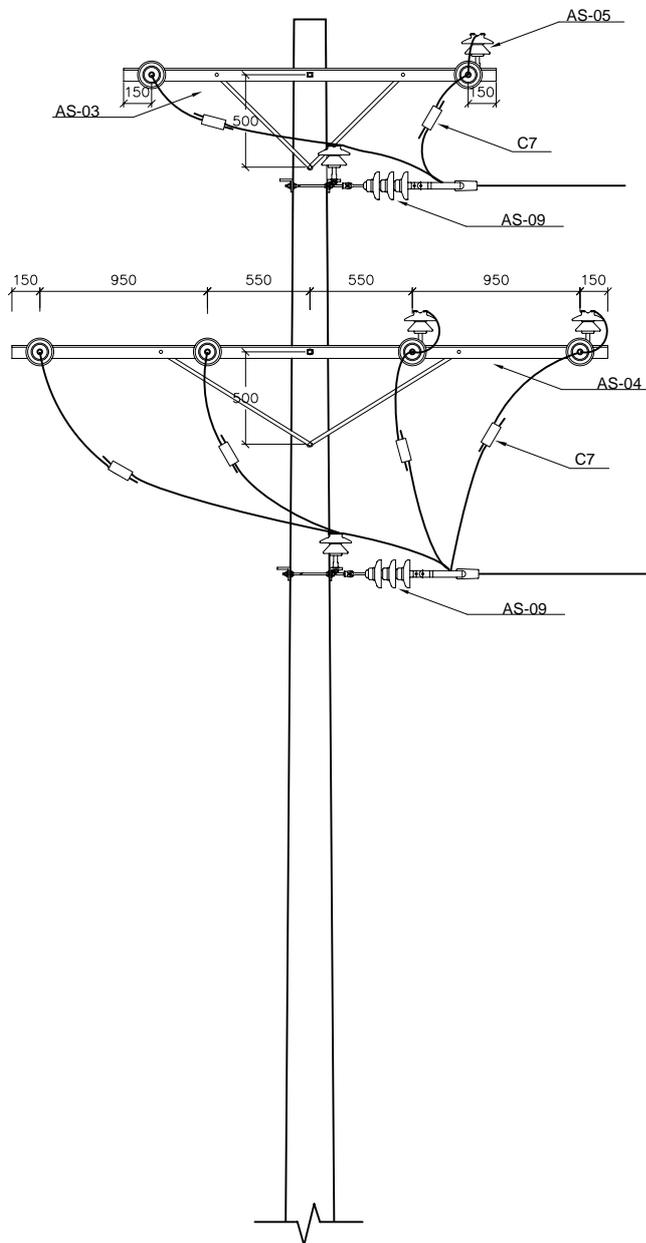
Drawing:

Date: March, 2005

Revision: 2

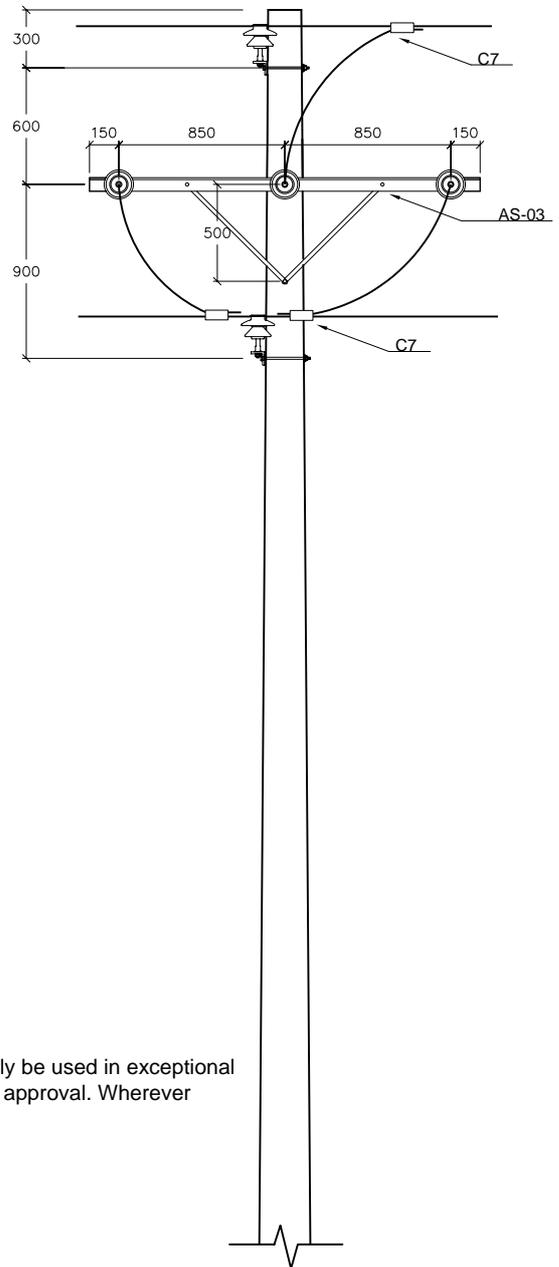
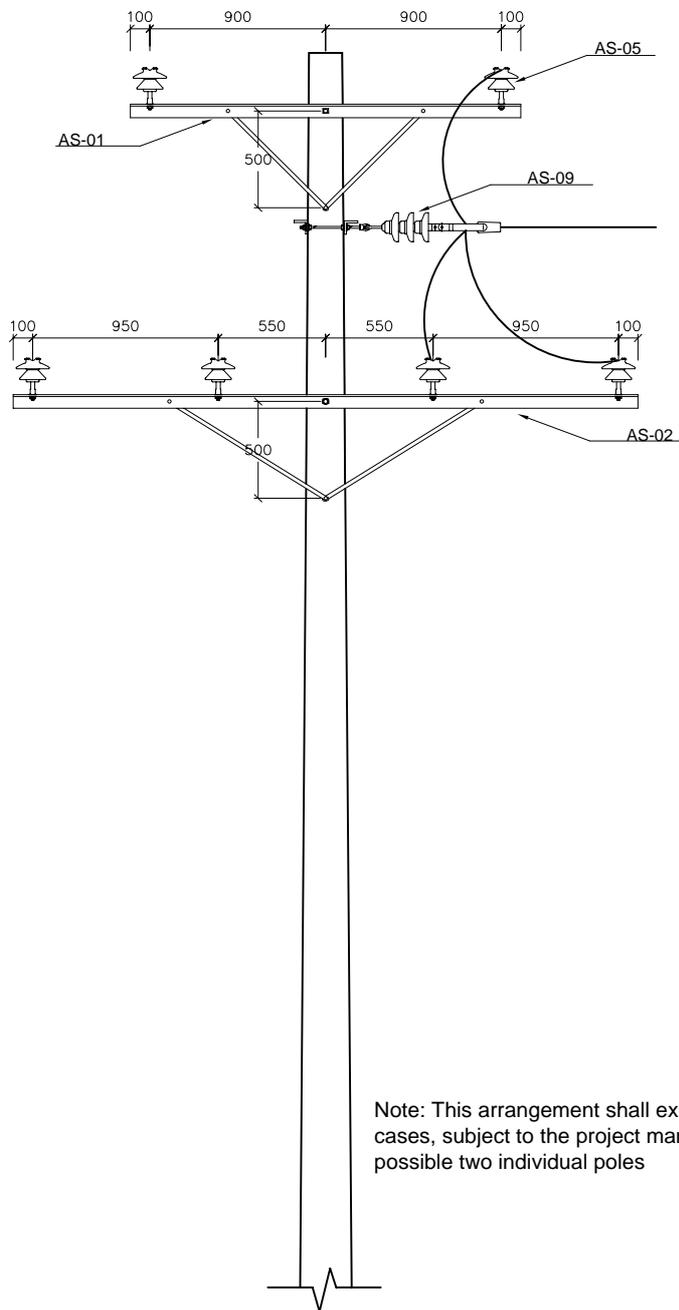
Scale: Without

U MV-602C



Assembly	Qty.	Description	Material	Qty.	Description
AS-03	2	Double crossarm steel (2000 mm)			
AS-04	2	Double crossarm steel (3200 mm)		6	Preformed distribution ties for ACSR
AS-05	6	Single support on crossarm (tangent)	C7	6	Compression tap connectors, H type for ACSR, as requested
AS-09	3	Deadend on crossarm			

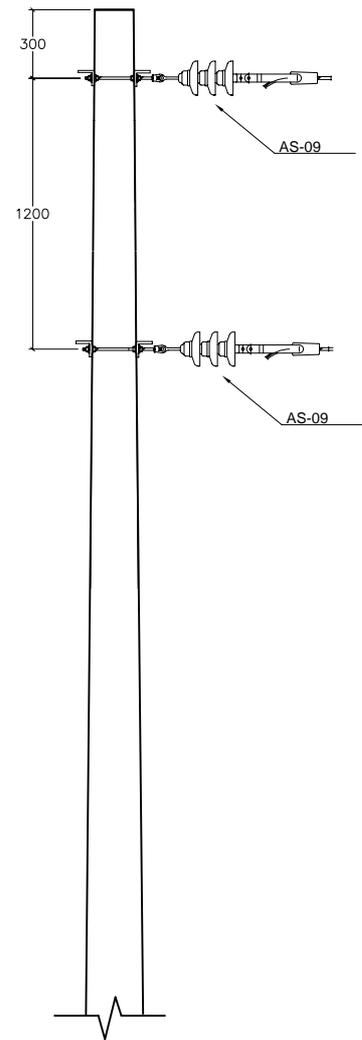
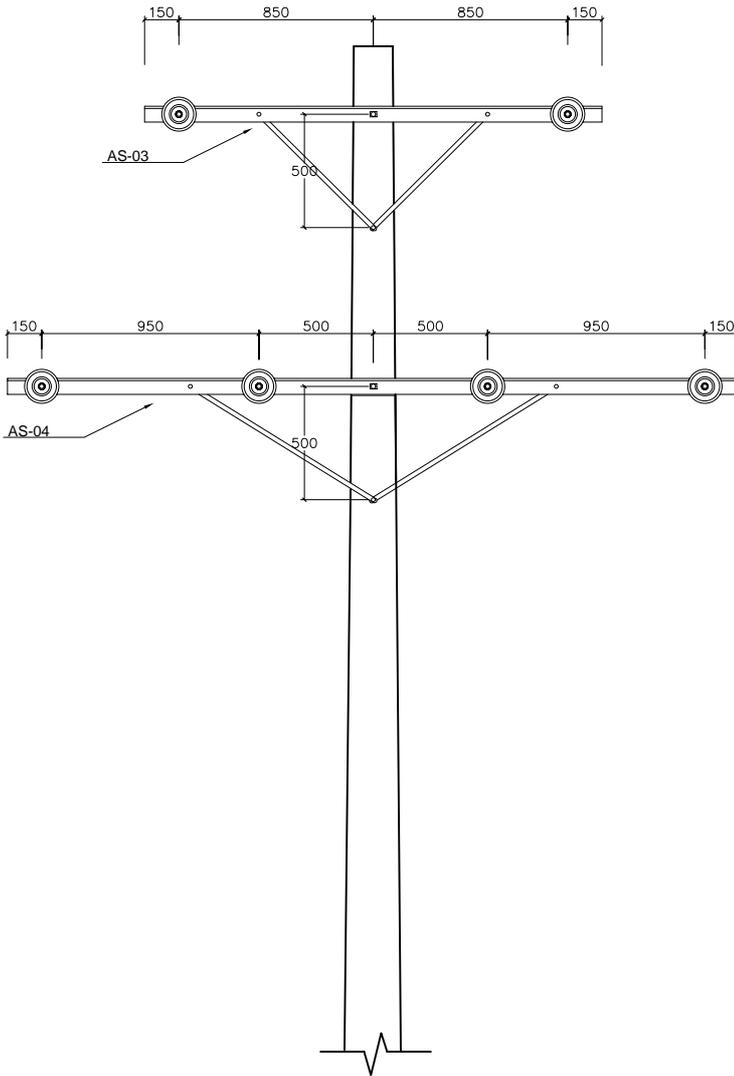
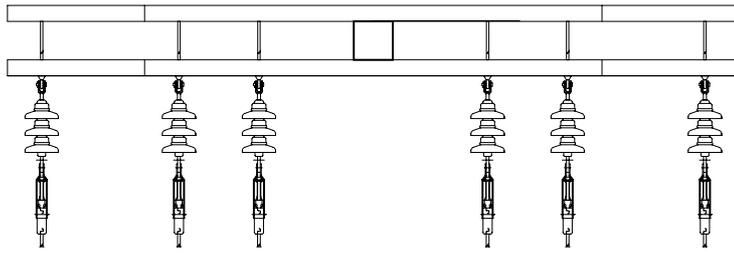
 <p>Ministry of Water and Power decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH</p>		Deadend on crossarm (angle 60°-90°) double circuit, MV			Drawing:	
		Rehabilitation and Extension of Kabul City Distribution Network	Date: March, 2005	Revision: 2	Scale: Without	U



Note: This arrangement shall exclusively be used in exceptional cases, subject to the project managers approval. Wherever possible two individual poles

Assembly	Qty.	Description	Material	Qty.	Description
AS-01	1	Single crossarm steel (2000 mm)			
AS-02	1	Single crossarm steel (3200 mm)		6	Preformed distribution ties for ACSR
AS-03	1	Double crossarm steel (2000 mm)	C7	3	Compression tap connectors, H type for ACSR, as requested
AS-05	6	Single support on crossarm (tangent)			
AS-09	3	Deadend on crossarm			

 <p>Ministry of Water and Power decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH</p>		<p>Single support on crossarm with tap guide double circuit, MV</p>			<p>Drawing:</p>	
		<p>Rehabilitation and Extension of Kabul City Distribution Network</p>	<p>Date: March, 2005</p>	<p>Revision: 2</p>	<p>Scale: Without</p>	<p>U</p>



Assembly	Qty.	Description	Material	Qty.	Description
AS-03	1	Double crossarm steel (2000 mm)			
AS-04	1	Double crossarm steel (3200 mm)			
AS-09	6	Deadend on crossarm			



Ministry of Water and Power
decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH



Rehabilitation and Extension of Kabul City
Distribution Network

Single deadend on crossarm
double circuit, MV

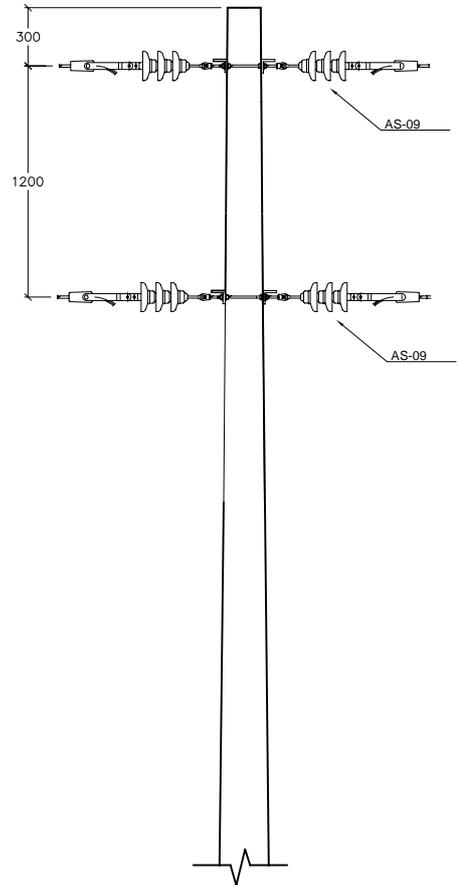
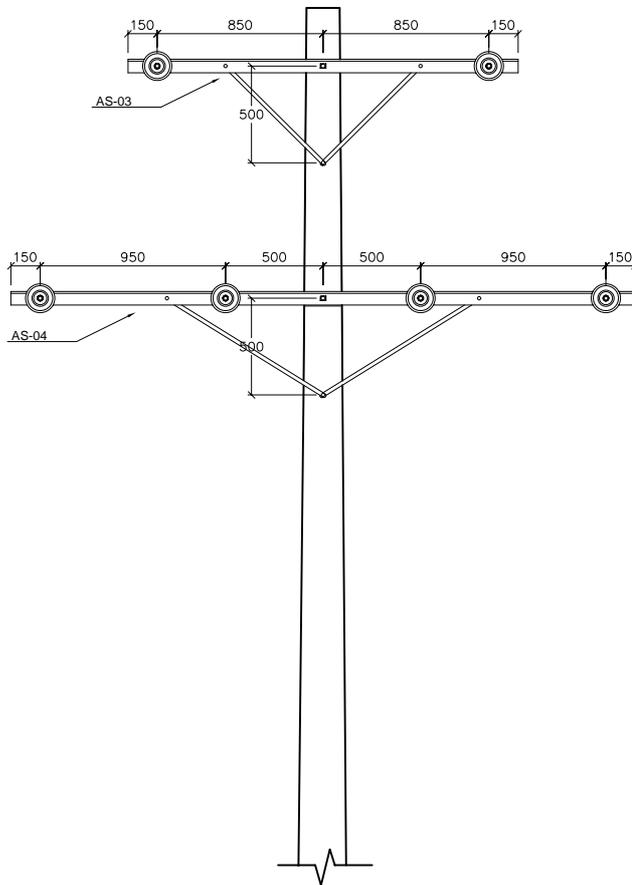
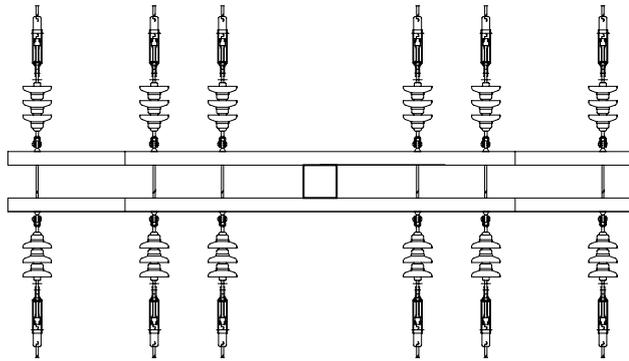
Drawing:

Date: March, 2005

Revision: 2

Scale: Without

U MV-605C



Assembly	Qty.	Description	Material	Qty.	Description
AS-03	1	Double crossarm steel (2000 mm)			
AS-04	1	Double crossarm steel (3200 mm)			
AS-09	12	Deadend on crossarm			



Ministry of Water and Power
decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH



Rehabilitation and Extension of Kabul City
Distribution Network

Double deadend on crossarm
double circuit, MV

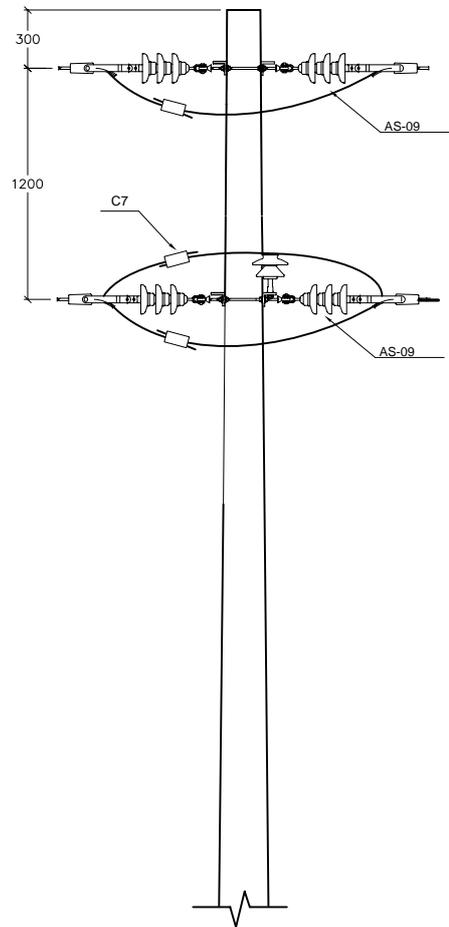
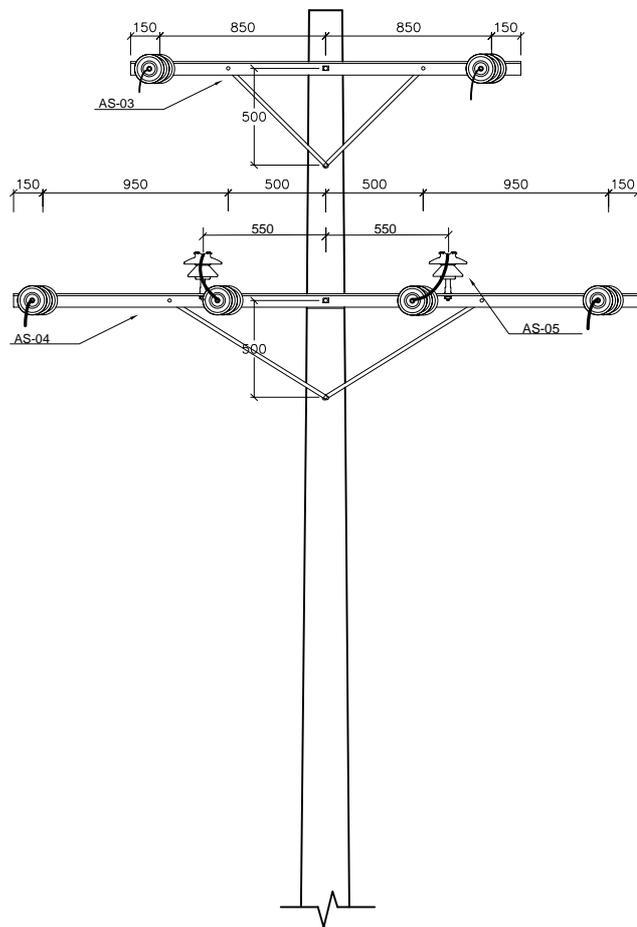
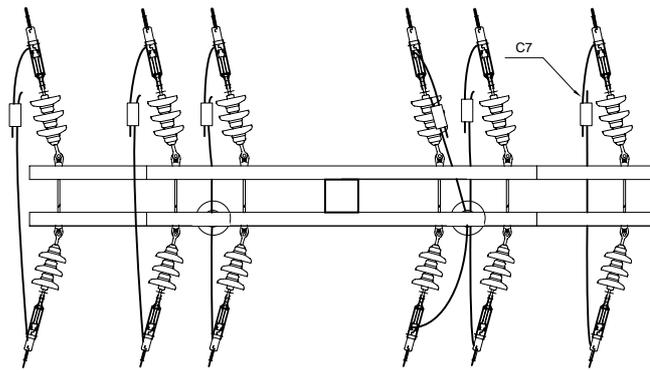
Drawing:

Date: March, 2005

Revision: 2

Scale: Without

U MV-606C



Assembly	Qty.	Description	Material	Qty.	Description
AS-03	1	Double crossarm steel (2000 mm)			
AS-04	1	Double crossarm steel (3200 mm)		2	Preformed distribution ties for ACSR
AS-05	2	Single support on crossarm (tangent)	C7	6	Compression tap connectors, H type for ACSR, as requested
AS-09	6	Deadend on crossarm			

 <p>Ministry of Water and Power decon DEUTSCHE ENERGIE-CONSULT INGENIEURGESELLSCHAFT mbH</p>		<p>Deadend on crossarm (angle 15°- 60°) double circuit, MV</p>			Drawing:	
					<p>Rehabilitation and Extension of Kabul City Distribution Network</p>	

**APPENDIX D
ACRONYMS**

Acronyms

The following acronyms are used in this report.

ACSR	Aluminum Conductor Steel Reinforced
km	kilometer
BKT	Kandahar Breshna Kot Substation
DABS	Da Afghanistan Breshna Sherkat
kV	Kilo Volts
kWH	Kilo Watt Hour
m	meter
mm ²	Millimeters squared
MV	Medium Voltage (20kV, etc.)
MVA	Mega Volt-Amperes
SPV	Solar Photovoltaic
USAID	United States Agency for International Development
USD	US Dollars
MEW	Ministry of Energy and Water