

**RAMADI 132-KILOVOLT SUBSTATION
RAMADI, IRAQ**



**SIGIR PA-08-153
JANUARY 27, 2009**



Ramadi 132-Kilovolt Substation

What SIGIR Found

On November 19, 2008, SIGIR performed an on-site assessment of the Ramadi 132-kilovolt Substation project. The total contract cost, including modification, was \$28.7 million.

During the site visit, renovation and construction work was still ongoing. In general, the construction appeared to meet the standards of the Statement of Work. SIGIR did not observe significant deficiencies or any noticeable defects associated with the quality of workmanship during the site visit. The observed construction work associated with the substation appeared to meet the standards of the contract. When completed, the project should meet and be consistent with the original contract objectives.

Due to security concerns, SIGIR performed an expedited assessment. The time allotted was approximately 40 minutes; therefore, a comprehensive review of all work completed was not possible.

The contractor provided the required 30% design drawings, but only limited 60% design submittals, and no 90% design submittals. SIGIR reviewed the electronic copies of the submitted 30% and 60% design drawings and specifications. The limited drawings appear to be adequate to construct the electrical substation, and install and commission all associated equipment.

The contractor did not provide a quality control plan to guide the contractor's quality management program. The contractor did submit daily, weekly, and monthly quality control reports. However, the contractor did not maintain deficiency logs to document problems noted with construction activities.

The U.S. government's quality assurance program was effective in monitoring the contractor's quality control program. The quality assurance representative maintained a presence at the construction site and provided daily quality assurance reports that contained project-specific information to document construction progress and highlight deficiencies.

Sustainability requirements under the current contract appear adequate for the operation of the electrical substation. The contract included factory-based and site-based training for Iraqi Ministry of Electricity operations and maintenance personnel on the primary equipment and systems.



Summary of Report: PA-08-153

Why SIGIR Did This Study

SIGIR is assessing projects funded under the Iraq Relief and Reconstruction Fund. SIGIR did this assessment to determine whether project components were adequately designed prior to construction or installation; whether construction or rehabilitation met the standards of the design; whether the contractor's quality control program and the U.S. government's quality assurance program were adequate; whether project sustainability was addressed; and whether the project results were consistent with the original objectives.

The objective of the Ramadi 132-kilovolt Substation project is to provide a complete and fully functional substation compatible with the Ministry of Electricity's transmission system. The substation will be used to convert high-voltage transmission electricity to low-voltage distribution electricity.

What SIGIR Recommends

SIGIR recommends that the Gulf Region Division of the U.S. Army Corps of Engineers continue efforts to expedite the repair of the gas-insulated switchgear and require the contractor to provide the 90% design submittals.

We received comments on a draft of this report from the U.S. Army Corps of Engineers, advising that the Gulf Region Division generally concurred with the report's findings and recommendations. In addition, the U.S. Army Corps of Engineers provided comments to clarify or correct technical aspects of the report and addressed the actions planned for the gas-insulated switchgears. SIGIR reviewed the comments provided and revised the final report as appropriate.



SPECIAL INSPECTOR GENERAL FOR IRAQ RECONSTRUCTION

January 27, 2009

MEMORANDUM FOR COMMANDING GENERAL, UNITED STATES CENTRAL
COMMAND
COMMANDING GENERAL, MULTI-NATIONAL FORCE-
IRAQ
COMMANDING GENERAL, JOINT CONTRACTING
COMMAND-IRAQ/AFGHANISTAN
COMMANDER, GULF REGION DIVISION, U.S. ARMY
CORPS OF ENGINEERS
DIRECTOR, IRAQ TRANSITION ASSISTANCE OFFICE

SUBJECT: Report on Ramadi 132-Kilovolt Substation in Ramadi, Iraq
(SIGIR Report Number PA-08-153)

We are providing this project assessment report for your information and use. We assessed the design and construction work being performed at the Ramadi 132-kilovolt Substation in Anbar, Iraq, to determine its status and whether objectives intended will be achieved. SIGIR made this assessment to provide you and other interested parties with real-time information on a relief and reconstruction project underway and in order to enable appropriate action to be taken, if warranted.

Comments on a draft of this report were received from the U.S. Army Corps of Engineers, advising that the Gulf Region Division generally concurred with the report's findings and recommendations. In addition, the U.S. Army Corps of Engineers provided comments to clarify or correct technical aspects of the report and addressed the actions planned for the gas-insulated switchgears. SIGIR reviewed the comments provided and revised the final report as appropriate. As a result, comments to this final report are not required.

If you have any questions, please contact Mr. Brian Flynn at DSN 318-239-2485 or via e-mail at brian.flynn@iraq.centcom.mil. For public affairs queries concerning this report, please contact SIGIR Public Affairs at publicaffairs@sigir.mil or at 703-428-1100.

Stuart W. Bowen, Jr.
Inspector General

Special Inspector General for Iraq Reconstruction

SIGIR PA-08-153

January 27, 2009

Ramadi 132-Kilovolt Substation Ramadi, Iraq

Synopsis

Introduction. This project assessment was initiated as part of SIGIR's continuing assessments of selected sector reconstruction activities for the electricity sector. The overall objectives were to determine whether selected sector reconstruction contractors were complying with the terms of their contracts or task orders and to evaluate the effectiveness of the monitoring and controls exercised by administrative quality assurance and contract officers.

Project Objective. The objective of the Ramadi 132-kilovolt Substation is to provide a complete and fully functional substation compatible with the Ministry of Electricity's transmission system. The substation will be used to convert high-voltage transmission electricity to low-voltage distribution electricity. The total contract value for this Iraq Relief and Reconstruction Funds project is over \$28.7 million.

Project Assessment Objective. SIGIR conducted this limited scope assessment in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team included an engineer/inspector and an auditor/inspector. Specifically, SIGIR determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. The contractor's quality control program and the U.S. government's quality assurance program were adequate;
4. Project sustainability was addressed; and
5. Project results were consistent with original objectives.

Conclusions. The assessment determined that:

1. The contract included requirements for project design and specification submittals and approvals, and submission of 30%, 60%, and 90% design submittals with U.S. government review. The contractor provided the required 30% design drawings, but only limited 60% design submittals, and no 90% design submittals. The assessment team reviewed the electronic copies of the submitted 30% and 60% design drawings and specifications that Gulf Region Division reviewed. Based on SIGIR's review of the drawings and specifications, the limited drawings appear to be adequate to construct the electrical substation, and install and commission all associated equipment.
2. During the site visit on 19 November 2008, renovation and construction work was still ongoing. In general, the construction appeared to meet the standards of the Statement of Work. SIGIR did not observe significant deficiencies or any noticeable defects associated with the quality of workmanship during its visit to

the project site. The observed construction work associated with the Ramadi 132-kilovolt Substation appeared to meet the standards of the contract.

3. The contractor did not provide a quality control plan to guide the contractor's quality management program. The contractor did submit daily, weekly, and monthly quality control reports. The quality control reports contained information such as the work accomplished each day, including the location and activity performed; identification of the workers involved; equipment utilized; and material received on site. However, the contractor did not maintain deficiency logs to document problems noted with construction activities.

The U.S. government's quality assurance program was effective in monitoring the contractor's quality control program. The quality assurance representative maintained a presence at the construction site and provided daily quality assurance reports that contained project-specific information to document construction progress and highlight deficiencies. The quality assurance representative supplemented the daily reports with detailed photographs that reinforced the narrative information provided in the reports. The U.S. government's quality assurance program was adequate and should ensure the successful completion of the Ramadi 132-kilovolt Substation project.

4. Sustainability requirements under the current contract appear adequate for the operation of the electrical substation. The contract included factory and site-based training for Iraqi Ministry of Electricity operations and maintenance personnel on the primary equipment and systems. The training should allow for a seamless transition on completion of the project. In accordance with the manufacturer's requirements, the Ministry of Electricity personnel will receive the necessary training to ensure sustainment of the operation and maintenance of the substation, thereby providing lasting benefits to the community. In addition, the contract required operations and maintenance manuals for the substation systems and spare parts for maintenance operations.
5. The original contract objective was to provide a substation to convert high-voltage transmission electricity to low-voltage distribution electricity. The Ramadi 132-kilovolt Substation contract, awarded on 14 August 2006, incurred approximately a six-month delay while the Ministry of Electricity decided which site was to be used for the project. The delay resulted in an extension of the project completion date, because the contractor could not access the site until 27 January 2007. When the Ministry of Electricity settled on a desired substation site, the existing utilities at the selected site required rework to accommodate the new substation. This further delayed design of the substation because the contractor was delayed in identifying the location of soil to be sampled.

During the installation of the electric equipment, the contractor noticed that the gas-insulated switchgear had a crack in the housing that rendered the equipment unusable. The damaged 132-kilovolt gas insulated switchgear bays had broken mountings. The gas-insulated switchgear vendor indicated that rebuilding the units could take as much as 12 months, although the time could be reduced if critical parts were available. The U.S. Army Corps of Engineers indicated that different options are being discussed to address this problem. Therefore, the project, currently 88% complete, when completed, albeit tardy, should meet and be consistent with the original contract objectives.

Recommendations. SIGIR recommends that the Gulf Region Division (GRD) of the U.S. Army Corps of Engineers:

1. Continue efforts to expedite repair of the gas-insulated switchgear.
2. Require the contractor to provide the 90% design submittals.

Management Comments. GRD concurred with Recommendation 1 noting that the manufacturer will replace the gas-insulated switchgear units and that the contractor was working expeditiously to obtain replacements for the three defective gas insulated switchgear units from the manufacturer. GRD agreed with recommendation 2 that the contractor should provide the 90% design submittals required by the contract and that if GRD concludes that it does not need the 60% drawings, it will process a contract modification. GRD also provided additional comments for clarity and accuracy. We revised the final report as appropriate.

Evaluation of Management Comments. SIGIR appreciates the concurrence by the U.S. Army Corps of Engineers with the draft report's recommendations. SIGIR reviewed the comments provided by the Gulf Region Division and revised the final report as appropriate.

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Introduction

Objective of the Project Assessment

The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties to enable appropriate action, when warranted. SIGIR conducted this limited scope assessment in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team included an engineer/inspector and an auditor/inspector. Specifically, SIGIR determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. The contractor's quality control (QC) program and the U.S. government's quality assurance (QA) program were adequate;
4. Sustainability was addressed; and
5. Project results were consistent with original objectives.

Pre-Site Assessment Background

Contract, Task Order and Costs

The 132-kilovolt (kV) Substation will be completed under Contract W91GXY-06-C-0072, dated 14 August 2006, a firm-fixed-price contract for \$27,930,416.68. The contract was between the Joint Contracting Command – Iraq and Symbion-Ozdil-Al Namarq Joint Venture to complete the design, supply, and testing of equipment, construction, installation, and commissioning activities necessary to provide Ramadi with a 132/33/11-kV gas insulated switchgear (GIS) substation. The contract stated that the period of performance was 350 days.

There were six amendments and/or modifications to the Contract W91GXY-06-C-0072. Modification P00001, issued 20 January 2007, changed the basic contract to allow progress payments for engineered equipment. The total contract value decreased by \$70,204 from \$27,930,416 to \$27,860,212. Modification P00002, issued 18 April 2007, increased the construction labor and decreased the civil works. However, the total contract value remained unchanged. Amendment 00001, issued 30 June 2007, extended the completion date for 166 calendar days. The contractor could not access the site until 27 January 2007, even though the contract was awarded on 14 August 2006. The new contract completion date was established as 12 January 2008. The contractor reserved the right to recover for the added costs incurred during this delay. Amendment 00002, issued 25 July 2007, allowed for contractor life support services on Camp Falluja. In exchange for the life support services, the contract total value decreased by \$54,000 from \$27,860,212 to \$27,806,212. Amendment 00003, issued 21 August 2007, stated that the contractor would construct a perimeter wall. The total contract value increased by \$247,058 from \$27,806,212 to \$28,053,270. Amendment 00004, issued 28 September 2007, provided additional resources to relocate two 250-millimeter water lines and one 600-millimeter water line to avoid interference with the proposed substation facilities. In addition, the amendment provided the resources to relocate the existing

underground 11-kV power lines to avoid interference with the proposed substation facilities. The total contract value increased by \$735,759 from \$28,053,270 to \$28,789,029.

Project Objective

The Al Anbar Provincial Development Committee requested the construction of a 132-kV line in the City of Al Ramadi to ease the city's critical shortage of electrical power. The objective of the Ramadi 132-kV Substation, when construction and commissioning activities are completed, is to provide a complete and fully functional substation compatible with the Ministry of Electricity's transmission system. The substation will be used to convert high-voltage transmission electricity to low-voltage distribution electricity.

Description of the Facility (preconstruction)

The description of the facility (preconstruction) was based on information obtained from the U.S. Army Corps of Engineers (USACE) project file. The Ramadi 132-kV Substation project is located in the Anbar province, west of Baghdad. Figure 1 provides an aerial view of the existing substation and the southwestern location of the land plot designated for the new Ramadi 132-kV Substation. The Euphrates River is located to the northeast of the Ramadi 132-kV Substation project.

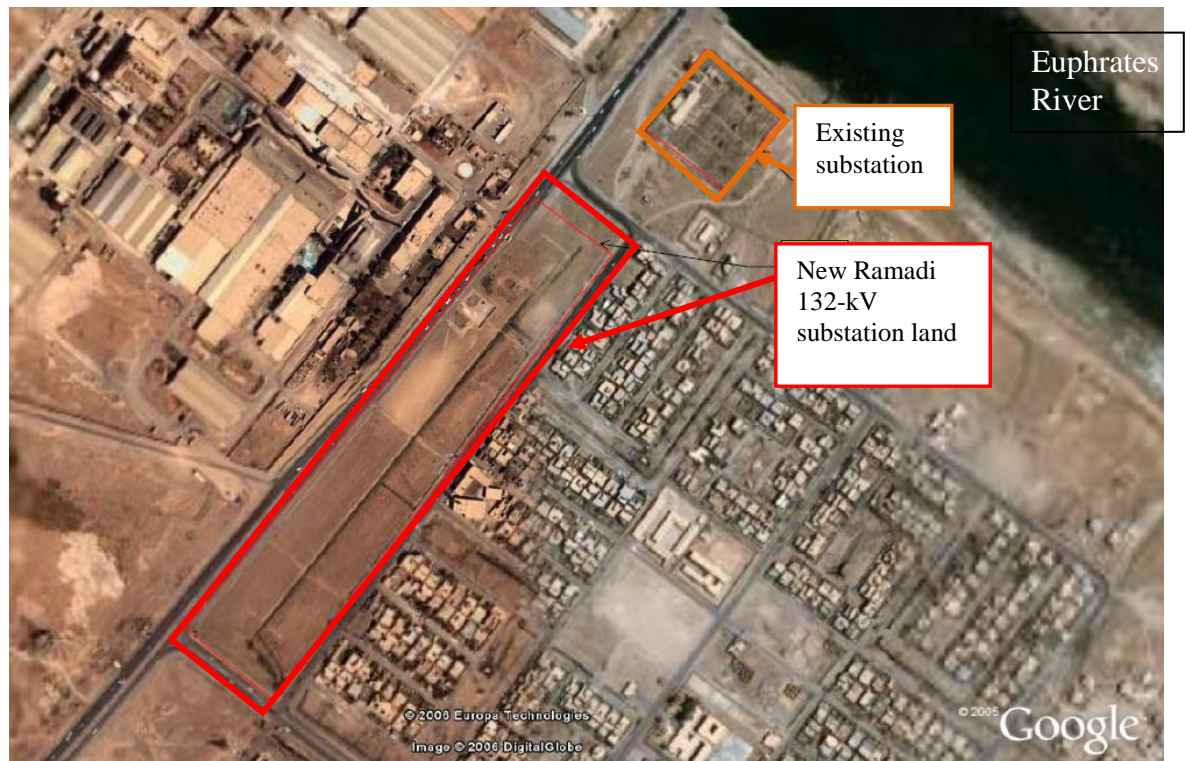


Figure 1. Aerial view of substation (Courtesy of USACE)

Statement of Work

The initial Statement of Work (SOW) for the project, dated 14 August 2006, included the major tasks for the construction of the Ramadi 132-kV Substation project listed below:

- clean and prepare the designated site
- construct perimeter fencing, gates, access roads, walkways, and guardhouse
- construct 132-kV GIS, 33-kV switchgear, 11-kV switchgear, and control and relay building
- construct power and control cable concrete trenches, road crossings, ducts, and manholes
- furnish and install 132-kV equipment
- furnish and install 33-kV equipment
- furnish and install 11-kV equipment
- supply and install 132-kV, 33-kV, and 11-kV cables to switchgears
- supply and install 132-kV, 33-kV, and 11-kV control and protection panels
- supply and install the Supervisory Control and Data Acquisition system

Current Project Design and Specifications

Design functions will include, but not be limited to, the preparation and submission of items for review by the U.S. government Project and Contracting Office such as calculations, studies, methodologies, operation and maintenance (O&M) manuals, construction drawings, and as-built drawings. The contractor will be fully responsible for ensuring that design, engineering, procurement, bill of quantities, construction and commissioning documents, and information in this scope of work are accurate and complete.

The contract includes requirements for project design and specification submittals and approvals. The SOW required the submission of 30%, 60%, and 90% design submittals, and government review. The contract required that the design and construction work be based on industry-accepted standards such as the Ministry of Electricity (MOE) Project Specifications, International Electro-technical Commission Standards, British Standards, and manufacturer recommendations. In addition, the contract stated that the design package should be divided into divisions, and the drawing should be designated. The contract required a minimum of 36 design submittals for the 60% design review and 12 design submittals for the 90% design review.

The contractor provided six 60% design submittals for the project that included:

- architectural drawings of buildings
- substation building construction, reinforcing, and detail drawings
- site civil works including roads, drainage, cable trenches, walls, and boundary fencing
- equipment foundations construction, reinforcing, and detail drawings
- transformer oil containment design drawings
- general arrangement drawings of substation crane, plan/sections of rails, areas covered
- cable trench and conduit plans

The contractor's 60% design submittals did not include electrical calculations; substation building civil calculations; equipment foundation design calculations; plan and sections showing lightning protection for buildings and switchyards; earthing system ground resistivity measurements and design calculations; earthing system design drawings, grid plan layout and equipment schedule; preliminary cable schedules; or air conditioning and ventilation system calculations, plans, and evaluations. In addition, the contractor did not provide 90% design submittals.

According to USACE representatives, the contract was awarded on 14 August 2006; however, the project incurred approximately six months of delay while the MOE decided which site was to be used for the project. The delay resulted in an extension of the project completion date, since the contractor could not access the site until 27 January 2007. In addition, when the MOE settled on the site, the existing utilities at the selected site needed to be re-routed to accommodate the new substation. This further delayed design of the substation because the contractor was delayed in identifying the location of soil to be sampled.

The assessment team reviewed electronic copies of the design and specifications. The contractor submitted the required 30% and six of the 60% design drawings and specifications that Gulf Region Division reviewed with comments. Based on SIGIR's review of the drawings and specifications, the drawings appear to be limited but adequate to construct the electrical substation, and install and commission all associated equipment.

Site Assessment

On 19 November 2008, SIGIR performed an on-site assessment of the Ramadi 132-kV Substation project. Due to security concerns, the time allotted for the site visit was approximately 40 minutes. According to the USACE, the project was then 88% complete, so the substation was not operational or occupied. Three USACE Gulf Region Central (GRC) representatives accompanied SIGIR on the site assessment. During the site visit, SIGIR noted that the contractor had multiple crews working at the Ramadi 132-kV Substation facility, and the contractor's representatives accompanied SIGIR on the project walkthrough.

Work Completed

Guard House and Perimeter Wall

The design required a guardhouse at the site entrance gate from the main public road (Figure 2). The site assessment team walked around the guardhouse (Site Photo 1); however, due to time limitations, did not enter. The wall design required a 2.0 meter high wall along the perimeter of the Ramadi 132-kV Substation (Site Photo 2), using thick reinforced concrete block (Site Photo 3) with a continuous reinforced concrete footer. The perimeter wall, surrounding the Ramadi 132-kV Substation, appeared well constructed with adequate brick alignment and quality mortar.

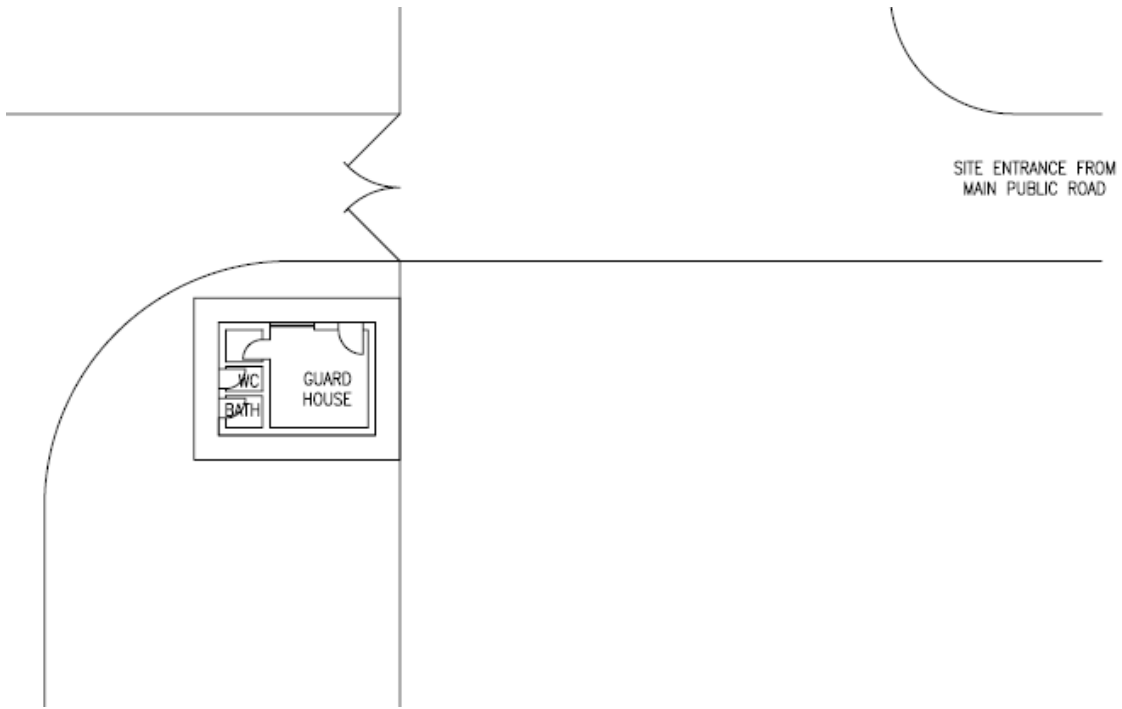


Figure 2. Guard house (Courtesy of USACE)



Site Photo 1. Guard house



Site Photo 2. Exterior perimeter wall



Site Photo 3. Interior view of the perimeter wall

132-kV Substation Building

The design required that the substation building consist of a ground floor and a first floor. The building was to have through-wall ducts and trenches on all four sides for the appropriate transformer and feeder cables. The exterior of the 132-kV Substation building appeared to be well constructed (Site Photo 4). There were exterior stairs located at either end of the building.



Site Photo 4. Exterior substation building

In addition, the interior of the substation building appeared to be well constructed (Site Photo 5). The ground floor design shows the columns required to support the heavy loads from the first floor's electrical equipment (Figure 3). During the site assessment, the inspectors observed that the ground floor columns were painted and there did not appear to be any patches. There were no obvious signs of cold joints, honeycombing, or steel exposure. The contractor had properly aligned and connected the elevated cable trays to the substation structure (Site Photo 6).



Site Photo 5. Interior finish

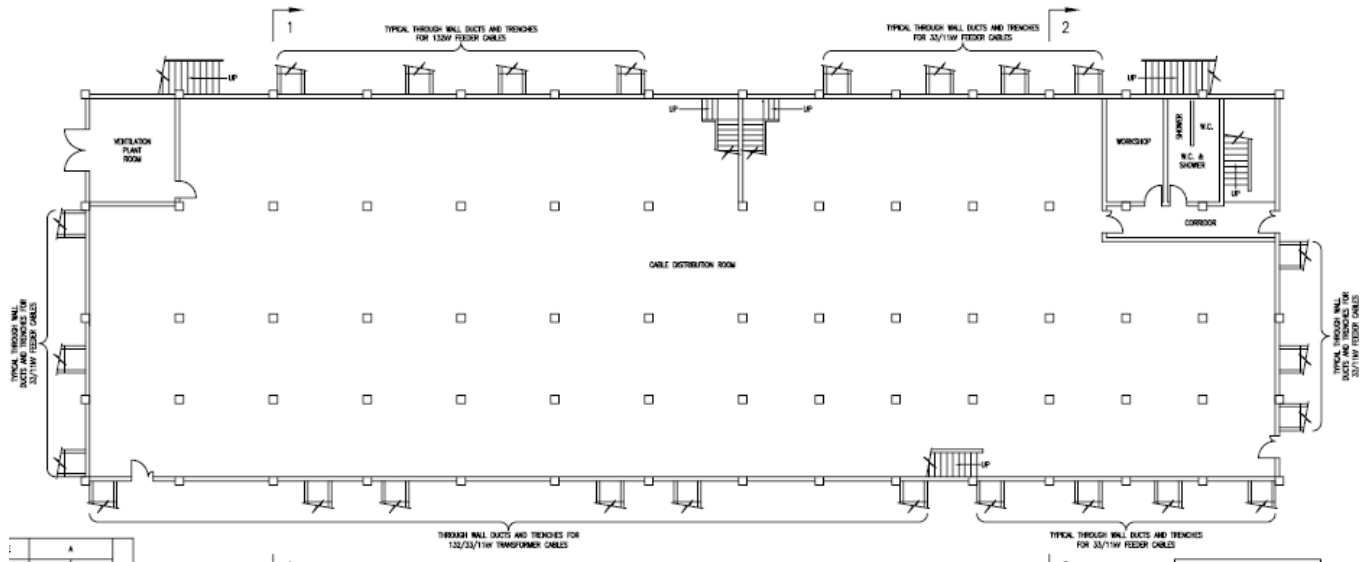


Figure 3. Substation building – ground floor (Courtesy of USACE)



Site Photo 6. Interior substation ground floor columns & cable trays

Cable Trays

The design required through-wall ducts and trenches for 132-kV feeder cables, 132/33/11 transformer cables, 33-kV feeder cables, and 11-kV feeder cables (Figure 4). The concrete cable trenches appeared to be well constructed and monolithic (Site Photo 7). For the wet season, the interior of the cable trenches has French drains (Site Photo 8). The cable trench proceeds up to the building (Site Photo 9), and the exterior wall of the substation has conduit installed to allow for the passage of cables from the transformer cables to enter the interior of the substation and for the feeder cables to exit the building (Site Photo 10).



Site Photo 7. Cable trenches



Site Photo 8. Cable trench interior

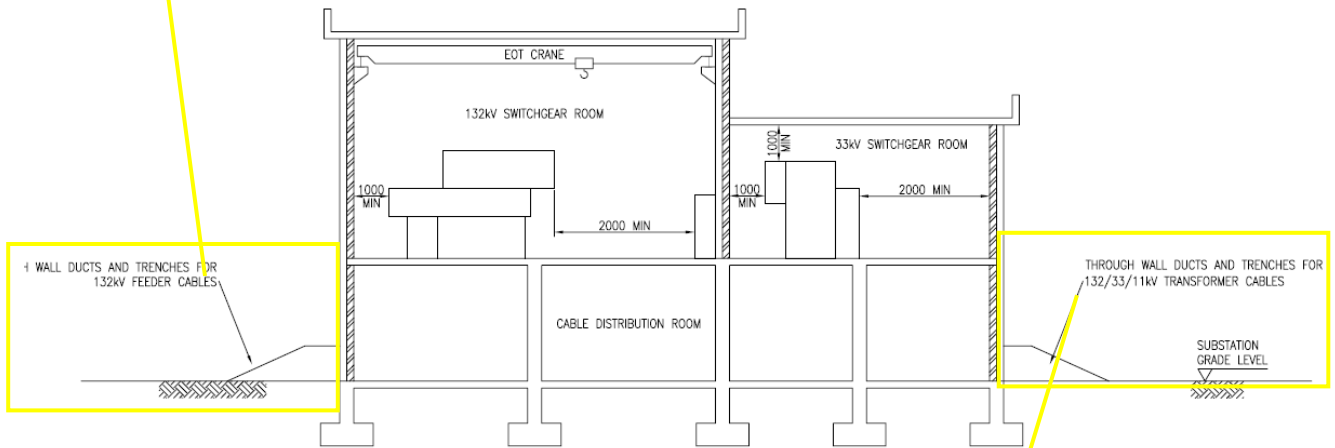


Figure 4. Side view of cable trenches (Courtesy of USACE)



Site Photo 9. Cable trench entering building



Site Photo 10. Entrances for cables

The design required the first floor of the substation building to have five main areas. Main areas of the first floor include the 132-kV switchgear room, 33-kV switchgear room, control/relay room, communication and battery room, and 11-kV switchgear room (Figure 5). During the site assessment, a majority of the switching equipment was not completely installed, and the GIS was still in the original plastic wrapping (Site Photo 11). The site assessment team observed that the Gantry crane was installed, but not operational (Site Photo 12). The contractor stated that the electrical equipment required complete assembly before Site Acceptance testing could be performed. Until repaired or a work around solution is found, the damaged GIS units are preventing complete installation and testing.

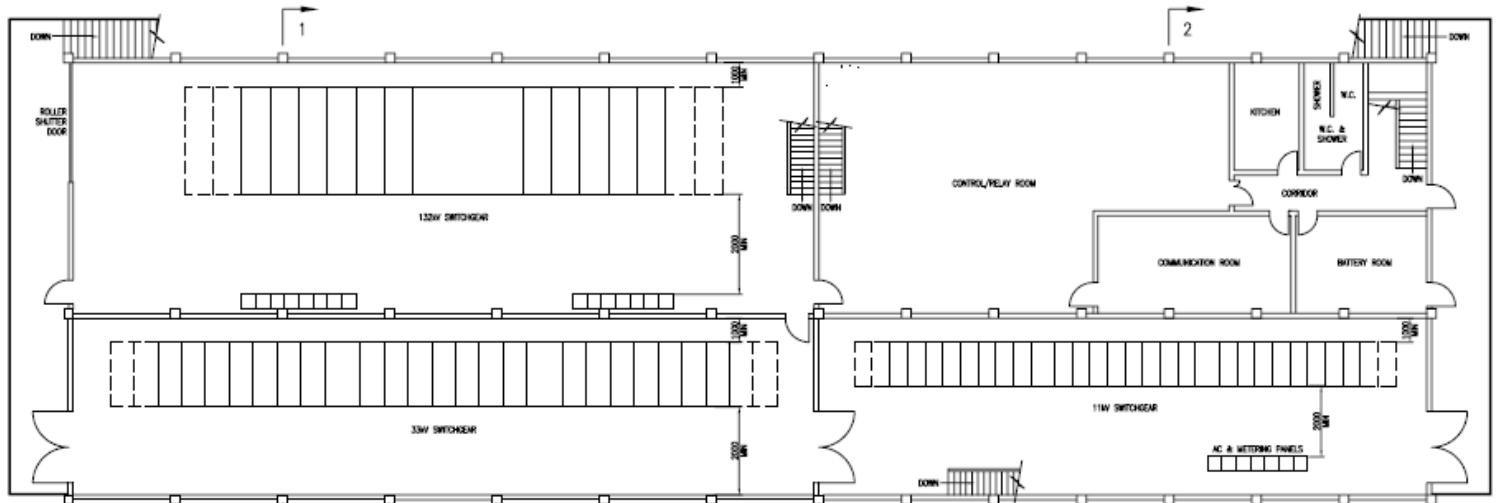


Figure 5. Substation building – first floor (Courtesy of USACE)



Site Photo 11. Gas insulated switch



Site Photo 12. Gantry crane

The contract and design required the purchase of a 33-kV and 11-kV switchgear and installation of the switchgear into the newly constructed substation building. The site assessment verified the installation of the 33-kV and 11-kV bay of electric metering equipment (Site Photo 13). Details from the associated factory nameplate were not obtained during the site assessment; however, the equipment and installation appeared to be consistent with the contract, design, and specifications.



Site Photo 13. Electric metering equipment

The capacitor banks looked new in appearance (Site Photo 14). The capacitors should provide greater reliability for the substation since the capacitors hold a charge on the system. This will provide a lag in the power drop when power is lost and will

maintain power in the system until power is restored. SIGIR verified the installation of a communications tower (Site Photo 15).



Site Photo 14. Capacitor banks



Site Photo 15. Communications tower

The transformers, located behind the substation building, had a filter apparatus connected to filter the dielectric fluid. The USACE representative stated that the dielectric fluid should be free from any air or particulates. The transformer bays had gravel grid that was clean and well sorted; the gravel absorbs any oil that leaks from the transformers. In addition, large walls separate the transformers to contain the spread of a potential fire (Site Photo 16).



Site Photo 16. Transformer bays

Work in Progress

Since the project was reportedly 88% complete, the substation is still under construction in various areas. The contract required the vehicular and pedestrian entrance gates to be made of steel construction. Currently the contractor has not completed the vehicular entrance or pedestrian gates (Site Photo 17). In addition, the contract stated that the contractor would provide external access roads. When the site assessment team toured the Ramadi 132-kV Substation, the roads were still a work in progress (Site Photo 18).



Site Photo 17. Pedestrian and vehicular entrances



Site Photo 18. Non-compacted road

Work Pending

Damaged 132-kV Gas Insulated Switchgear Bays

According to USACE, during the installation of the electrical equipment, the contractor noticed that one GIS had a crack in the housing that rendered the equipment unusable. The damaged 132-kV GIS bays E05 and E06 (Site Photo 19) have broken mountings, which are for the circuit breaker operating mechanism boxes, and damaged flanges for the busbar compartments. The mountings, located on the top of the circuit breaker head cover, cannot be repaired on site (Site Photo 20). A visual inspection of the damaged 132-kV GIS mountings indicates that professional welding is required. If welded in the field, the application of heat could damage the GIS. In addition, the impact that caused the break could have damaged internal GIS components. A factory examination can verify whether the internal moving parts were disturbed. Until the E05 and E06 are repaired and installed, one transformer (E05) and one line bay (E06) will not be commissioned.

On 30 November 2008, the USACE received an email from Areva, the vendor, that stated that the GIS casings were not opened. Areva's worst-case scenario was that rebuilding the units would take approximately twelve months. If the vendors have the critical parts available, then the time can be reduced. USACE indicated that different options were being discussed to circumvent waiting for the estimated period for returning the GIS equipment. USACE may take advantage of the design redundancies in the system and run the substation with the other GIS. However, USACE indicated that if this is done, the commissioning of the system would need to be reviewed and the warranty time with Areva may be increased.



Site Photo 19. GIS E05 and E06 (Courtesy of USACE)



Site Photo 20. Cracked GIS E05 and E06 (Courtesy of USACE)

Project Quality Management

Contractor's Quality Control Program

Department of the Army Engineering Regulation (ER) 1180-1-6, dated 30 September 1995, provides general policy and guidance for establishing quality management procedures in the execution of construction contracts. According to ER 1180-1-6, "...obtaining quality construction is a combined responsibility of the construction contractor and the government."

The contract stated that the contractor's QC will cover all design, construction, subcontractor, manufacturer, vendor, and supplier operations at any tier, both on and offsite. The contractor will furnish for review by the U.S. government, the contractor QC plan. The plan will identify personnel, procedures, control, instructions, tests, records, and forms to be used. The QC plan will describe the quality control organization; procedures for managing submittals; acceptance testing procedures; and procedures for tracking construction deficiencies. In the documentation provided by the USACE, SIGIR was unable to locate the contractor's QC plan.

Throughout the project, the contractor conducted daily, weekly, and monthly meetings to review applicable specifications, drawings, submittals, and testing before the start of definable activity on the project. The contractor maintained QC reports, which included descriptions of the day's activities and work performed, workers present, major equipment present, weather conditions, and significant events or concerns for the areas of the Ramadi 132-kV Substation project. In addition, the QC reports had records of tests, inspections, re-work, or deficiencies identified throughout the day. For example, the QC report, dated 15 February 2007, showed the soil investigation tests being conducted (Site Photo 21). In addition, the contractor provided the borehole results for the soil investigation. However, the contractor did not record the results of all concrete or cable tests taken, both passing

and failing, on the QC reports for the dates taken. There is no mention, on the few test results provided, the location where the tests were taken and the sequential control number identifying the test.



Site Photo 21. Split spoon sample (Courtesy of USACE)

The contractor's plan stated that once a deficiency was identified, the deficiency would be reported to the site supervisor for immediate action. The deficiency would be noted on the "Near Miss Report", which is maintained at the site office. Due to the limited time on site, SIGIR did not verify that the "Near Miss Reports" were maintained at the site office. Once the deficiency is rectified, the form is returned to the originator, and the Safety, Quality, and Environmental Officer verify completion and file the rectified deficiency. In addition, the daily, weekly, and monthly reports contain a "Safety Issues" area that addresses any deficiencies found at the project site. A deficiency is not removed from the "Safety Issues" until the issue is resolved. A review showed that the contractor maintained daily, weekly, and monthly meetings that contained a "Safety Issues" area. However, the "Safety Issues" area generally addressed safety deficiencies, not construction deficiencies.

In addition, the contractor should inspect and verify items as soon as received on site. According to USACE, during the installation of the electric equipment, the contractor noticed that one GIS had a crack in the housing that rendered the equipment unusable. Through a visual inspection of the 132-kV GIS, the contractor could have identified the problem earlier in the project.

After reviewing the quality control daily, weekly, and monthly reports, meetings, and submittals, the contractor's QC program was inadequate for the Ramadi 132-kV Substation project.

Government Quality Assurance Program

The USACE ER 1110-1-12 and Project and Contracting Office Standard Operating Procedure CN-100 specified requirements for a government QA program. Similar to the QC program, a crucial oversight technique is presence at the construction site. The USACE GRC, which was responsible for administration of the 132-kV Substation project, had dedicated personnel on site during significant construction activities. Local national QA representatives monitored field activities and completed daily QA reports, which were reviewed by the USACE GRC project engineer. The reports documented the number of workers on site and the work

performed for the day. In addition, the QA representatives supplemented the daily QA reports with detailed photographs that reinforce the information provided in the reports. The photographs documented any noted deficiencies that occurred at the site. The QA program is effective in monitoring the QC program and continues to ensure the successful completion of the Ramadi 132-kV Substation project.

Project Sustainability

The contract has sustainability requirements for the operation of the electrical substation that include factory and site based training for operations and maintenance personnel on the primary equipment and systems. Further, personnel will receive the necessary training for the operation and maintenance of the substation. Also, operational and maintenance manuals for the substation systems and spare parts for maintenance operations are included in the contract requirements. Specific contract requirements include:

- Commissioning & Training

The contractor will prepare a commissioning plan and submit for review and approval via the contracting officer. In addition, the contractor will be required to complete commissioning and startup activities.

The contractor will provide on-site and out-of-country training of employees to ensure a seamless transition between handover to the client and end-user. The contractor will train six O&M representatives at the major equipment-manufacturing site. During the commissioning period, the contractor will provide a month of on-site training for eight O&M representatives.

- Operations and Maintenance

The contractor will be required to provide operation and maintenance manuals. In addition, the contractor will provide records of tests and inspections carried out during the procurement, construction, and pre-commissioning/commissioning phases of the substation as part of the handover documentation.

- Warranties & Spare Parts

The contract stated that warranties are required to cover the fully functional substation. In addition, the warranties will include all installed equipment and systems. During the construction and commissioning phases, the contractor will ensure that the vendor requirements are met, so the warranties are not invalidated for the equipment and systems.

The contractor will supply the manufacturer's recommended spare parts for one year of operation. In addition, the contractor will provide a detailed list, which contains the part description, part number, and unit price of the manufacturer recommended spare parts for the second and third year operation.

Conclusions

Based upon the results of our site visit, SIGIR reached the following conclusions for assessment objectives 1, 2, 3, 4, and 5. Appendix A provides details pertaining to Scope and Methodology.

1. Determine whether project components were adequately designed prior to construction or installation.

The contract included requirements for project design and specification submittals and approvals, and submission of 30%, 60%, and 90% design submittals with U.S. government review. The contractor provided the required 30% design drawings, but only limited 60% design submittals, and no 90% design submittals. The assessment team reviewed the electronic copies of the submitted 30% and 60% design drawings and specifications that Gulf Region Division reviewed. Based on SIGIR's review of the drawings and specifications, the limited drawings appear to be adequate to construct the electrical substation, and install and commission all associated equipment.

2. Determine whether construction met the standards of the design.

During the site visit on 19 November 2008, renovation and construction work was still ongoing. In general, the construction appeared to meet the standards of the Statement of Work. SIGIR did not observe significant deficiencies or any noticeable defects associated with the quality of workmanship during its visit to the project site. The observed construction work associated with the Ramadi 132-kilovolt Substation appeared to meet the standards of the contract.

3. Determine whether the contractor's quality control program and the U.S. government quality assurance program were adequate.

The contractor did not provide a quality control plan to guide the contractor's quality management program. The contractor did submit daily, weekly, and monthly quality control reports. The quality control reports contained information such as the work accomplished each day, including the location and activity performed; identification of the workers involved; equipment utilized; and material received on site. However, the contractor did not maintain deficiency logs to document problems noted with construction activities.

The U.S. government's quality assurance program was effective in monitoring the contractor's quality control program. The quality assurance representative maintained a presence at the construction site and provided daily quality assurance reports that contained project-specific information to document construction progress and highlight deficiencies. The quality assurance representative supplemented the daily reports with detailed photographs that reinforced the narrative information provided in the reports. The U.S. government's quality assurance program was adequate and should ensure the successful completion of the Ramadi 132-kilovolt Substation project.

4. Determine if project sustainability was addressed.

Sustainability requirements under the current contract appear adequate for the operation of the electrical substation. The contract included factory and site-based training for Iraqi Ministry of Electricity operations and maintenance personnel on the primary equipment and systems. The training should allow for a seamless transition on completion of the project. In accordance with the manufacturer's requirements, the Ministry of Electricity personnel will receive the necessary training to ensure sustainment of the operation and maintenance of the substation, thereby providing lasting benefits to the community. In addition, the contract required operations and

maintenance manuals for the substation systems and spare parts for maintenance operations.

5. Determine whether project results were consistent with original objectives.

The original contract objective was to provide a substation to convert high-voltage transmission electricity to low-voltage distribution electricity. The Ramadi 132-kilovolt Substation contract, awarded on 14 August 2006, incurred approximately a six-month delay while the Ministry of Electricity decided which site was to be used for the project. The delay resulted in an extension of the project completion date, because the contractor could not access the site until 27 January 2007. When the Ministry of Electricity settled on a desired substation site, the existing utilities at the selected site required rework to accommodate the new substation. This further delayed design of the substation because the contractor was delayed in identifying the location of soil to be sampled.

During the installation of the electric equipment, the contractor noticed that the gas-insulated switchgear had a crack in the housing that rendered the equipment unusable. The damaged 132-kilovolt gas insulated switchgear bays had broken mountings. The gas-insulated switchgear vendor indicated that rebuilding the units could take as much as 12 months, although the time could be reduced if critical parts were available. The U.S. Army Corps of Engineers indicated that different options are being discussed to address this problem. Therefore, the project, currently 88% complete, when completed, albeit tardy, should meet and be consistent with the original contract objectives.

Recommendations

SIGIR recommends that the Gulf Region Division of the U.S. Army Corps of Engineers:

1. Continue efforts to expedite repair of the gas-insulated switchgear.
2. Require the contractor to provide the 90% design submittals.

Management Comments

GRD concurred with recommendation 1 noting that the manufacturer will replace the gas-insulated switchgear units and that the contractor was working expeditiously to obtain replacements for the three defective gas insulated switchgear units from the manufacturer. GRD agreed with recommendation 2 that the contractor should provide the 90% design submittals required by the contract and that if GRD concludes that it does not need the 60% drawings, it will process a contract modification. GRD also provided additional comments for clarity and accuracy.

Evaluation of Management Comments

SIGIR appreciates the concurrence by the U.S. Army Corps of Engineers with the draft report's recommendations. SIGIR reviewed the comments provided by the Gulf Region Division and revised the final report as appropriate.

Appendix A. Scope and Methodology

SIGIR performed this project assessment from November 2008 through January 2009 in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team included a professional engineer/inspector and an auditor/inspector.

In performing this Project Assessment, SIGIR:

- Reviewed contract documentation to include the following: Contract W91GXY-06-C-0072, Modification P00001, Modification P00002, Amendment 00001, Amendment 00002, Amendment 00003, and Amendment 00004;
- Reviewed the design package (drawings and specifications), contractor's quality control reports, U.S. Army Corps of Engineers quality assurance reports, and construction progress photos;
- Interviewed the U.S. Army Corps of Engineers, Gulf Region Division, Electricity Sector Program Manager; USACE, Gulf Region Central, Program Manager; and the USACE, Project Engineer; and
- Conducted an on-site assessment of the Ramadi 132-kV Substation project on 19 November 2008 and documented the results.

Scope Limitation. Due to security concerns, SIGIR performed an expedited assessment. The time allotted for the site visit was approximately 40 minutes; therefore, a complete review of all work completed was not possible.

Appendix B. Acronyms

ER	Engineering Regulation
GIS	gas insulated switchgear
GRC	Gulf Region Central
GRD	Gulf Region Division
kV	kilovolt
MOE	Ministry of Electricity
O&M	Operations and Maintenance
QA	Quality Assurance
QC	Quality Control
SIGIR	Special Inspector General for Iraq Reconstruction
SOW	Scope of Work or Statement of Work
USACE	United States Army Corps of Engineers

Appendix C. Report Distribution

Department of State

Secretary of State

Senior Advisor to the Secretary and Coordinator for Iraq

Director of U.S. Foreign Assistance/Administrator, U.S. Agency for
International Development

Director, Office of Iraq Reconstruction

Assistant Secretary for Resource Management/Chief Financial Officer,
Bureau of Resource Management

U.S. Ambassador to Iraq

Director, Iraq Transition Assistance Office

Mission Director-Iraq, U.S. Agency for International Development

Inspector General, Department of State

Department of Defense

Secretary of Defense

Deputy Secretary of Defense

Under Secretary of Defense (Comptroller)/Chief Financial Officer

Deputy Chief Financial Officer

Deputy Comptroller (Program/Budget)

Deputy Assistant Secretary of Defense-Middle East, Office of Policy/International
Security Affairs

Inspector General, Department of Defense

Director, Defense Contract Audit Agency

Director, Defense Finance and Accounting Service

Director, Defense Contract Management Agency

Department of the Army

Assistant Secretary of the Army for Acquisition, Logistics, and Technology

Principal Deputy to the Assistant Secretary of the Army for Acquisition,
Logistics, and Technology

Deputy Assistant Secretary of the Army (Policy and Procurement)

Commanding General, Joint Contracting Command-Iraq/Afghanistan

Assistant Secretary of the Army for Financial Management and Comptroller

Chief of Engineers and Commander, U.S. Army Corps of Engineers

Commanding General, Gulf Region Division

Chief Financial Officer, U.S. Army Corps of Engineers

Auditor General of the Army

U.S. Central Command

Commanding General, Multi-National Force-Iraq

Commanding General, Multi-National Corps-Iraq

Commanding General, Multi-National Security Transition Command-Iraq

Commander, Joint Area Support Group-Central

Other Federal Government Organizations

Director, Office of Management and Budget
Comptroller General of the United States
Inspector General, Department of the Treasury
Inspector General, Department of Commerce
Inspector General, Department of Health and Human Services
Inspector General, U.S. Agency for International Development
President, Overseas Private Investment Corporation
President, U.S. Institute for Peace

Congressional Committees

U.S. Senate

Senate Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Foreign Relations
Senate Committee on Homeland Security and Governmental Affairs

U.S. House of Representatives

House Committee on Appropriations
House Committee on Armed Services
House Committee on Oversight and Government Reform
House Committee on Foreign Affairs

Appendix D. GRD Comments on the Draft Report



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
GULF REGION DIVISION
BAGHDAD, IRAQ
APO AE 09348

CEGRD-CG

14 January 2008

MEMORANDUM FOR Special Inspector General for Iraq Reconstruction, US Embassy Annex II, Room 1013, APO AE 09316

SUBJECT: SIGIR Draft Project Assessment Report – Ramadi 132-Kilovolt Substation, Ramadi, Iraq, (SIGIR PA-08-153)

1. The Gulf Region Division reviewed the subject draft report and generally agrees with the facts as presented. GRD provides additional comments on the report recommendations and content in the enclosure.
2. Thank you for the opportunity to review the draft report and provide our written comments for incorporation in the final report.
3. If you have any questions, please contact Mr. Robert Donner at (540) 665-5022 or via email Robert.L.Donner@usace.army.mil.

Encl
as

Michael R. Eyre
MICHAEL R. EYRE
Major General, USA
Commanding

COMMAND REPLY
to
**SIGIR Draft Project Assessment Report – Ramadi 132-Kilovolt Substation,
Ramadi, Iraq**
SIGIR Report Number PA-08-153

Overall Comment. The Gulf Region Division (GRD) reviewed the project assessment draft report and generally agrees with the facts as presented. While we also agree with the focus of the report's recommendations, we believe that the parties involved are in the best position to accomplish the report's goals.

Recommendations:

SIGIR recommends that the Gulf Region Division of the U.S. Army Corps of Engineers:

1. Continue efforts to expedite repair of the gas-insulated switchgear.

Command Comment. Concur. The switch manufacturer will replace the gas-insulated switchgear units. The contractor is expeditiously working to obtain replacements for the three defective GIS units from the manufacturer.

2. Require the contractor to provide the 90% design submittals.

Command Comment. Concur. We agree that the contractor should provide the 90% design submittals required by the contract. If GRD concludes it does not need the 60 % drawings, it will process a contract modification.

GRD provides the following comments for clarity and accuracy.

1. Draft Report, page ii, fifth paragraph, second and third sentence. The Ramadi 132-kilovolt Substation contract, awarded on 14 August 2006, incurred approximately a six-month delay while the Ministry of Electricity decided which site was to be used for the project. The delay resulted in an extension of the project completion date, because the contractor could not access the site until 27 January 2007.

Command Comment. The contractor was unable to do any work at the site during the first several months because they did not have a management or subcontractor structure in place. In addition, the contractor did not have a civil engineering design asset until November 2006 when they employed a civil design company from Turkey.

Enclosure

2. Draft Report, page ii, fifth paragraph, fourth and fifth sentence. When the Ministry of Electricity settled on a desired substation site, the existing utilities at the selected site required rework to accommodate the new substation. This further delayed design of the substation because the contractor was delayed in identifying the location of soil to be sampled.

Command Comment. The existing utility issue was not consecutive to the site access issue. The contractor was able to continue work in other areas of the site pending the resolution of the utility issues.

3. Draft Report, page 3, second paragraph, first sentence. Design functions will include, but not be limited to, the preparation and submission of items for review by the U.S. government Project and Contracting Office such as calculations, studies, methodologies, operation and maintenance (O&M) manuals, construction drawings, and as-built drawings.

Command Comment. The Project and Contracting Office has not existed since it merged with GRD.

4. Draft Report, page 11, second paragraph, second and third sentence. The capacitors should provide greater reliability for the substation since the capacitors hold a charge on the system. This will provide a lag in the power drop when power is lost and will maintain power in the system until power is restored.

Command Comment. This is incorrect. GRD suggests rewriting this section to read as follows. The capacitors correct the normal inductive loading on the substation. This improves the efficiency of the grid and helps to avoid wasting power.

5. Draft Report, page 12, first paragraph, first, second and third sentence. SIGIR verified the installation of the SCADA tower (Site Photo 15). The SCADA tower will be helpful in the transmission and distribution of electricity. The SCADA system will allow the end users to understand how much capacity they have and what is available.

Command Comment. The tower outside the control building in Photo 5 is not a SCADA Tower. It is a communications tower and unrelated to the substation's functions. In addition, the communications tower is not part of this contract and the substation contractor did not install it. A Power Line Carrier system on the overhead power line accomplishes the SCADA communication.

Appendix E. Project Assessment Team Members

The Office of the Assistant Inspector General for Inspections, Office of the Special Inspector General for Iraq Reconstruction, prepared this report. The principal staff members who contributed to the report were:

Angelina Johnston

Justin Chenault, P.E.