

MOC-PWRI Statement of Work

May 7, 2013

Company Information:

Business Name : Far East Controls LLC
Sole Proprietor: Rodney L. Larson
Billing Address: P.O. Box 44847
Eden Prairie, MN 55344
Contact Phone #: (952)-960-1935

Philippine Contact Information:

c/o Nelson Lumbré
Isagani
Maasin City
Southern Leyte
Philippines 6600

952-960-1935	Vonage Phone that Rings in Maasin (local call from MN)
+63-906-277-4003	Cell Phone in Maasin
+63-53-570-9048	Land-Line in Maasin

The starting date for the on-site work to commence at the MOC-PWRI Shaking Table Facility in Tsubuka City, Japan is tentatively set for July 2013 through October 2013. Invoicing shall take place at the end of each trip or end-of-month to facilitate expense recovery.

Deliverables:

1. This project has a large number of detail operations that require documents to clearly identify successful completion and confirmation to the customer of project progress. These documents require the assistance to Far East Controls to create. These documents, as a minimum, shall include:
 - Microsoft Office Spreadsheet showing schedule prediction and actual project progress
 - Microsoft Office Spreadsheet showing detailed objective completion and sign-off by all responsible parties (MTS, MHI, and PWRI)
 - Microsoft Office Word Document detailing the processes to complete each objective
2. This project is going to require continuous on-site engineering management of the project. Some of the time, Far East Controls will represent MTS on-site to Hitachi, the customer and local vendors installing the new actuators.

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Deliverables, Cont'd:

3. The actuators and servovalves need to be calibrated before installation with the table. Each servovalve needs 3rd-stage spool calibration and valve tuning for identical frequency response within 3 degrees and 90 degree points within 2 Hz. The actuators then are 21-point calibrated using an external displacement standard. The goal is for a 0.5% maximum error over the dynamic stroke range. Larger percentages are allowed outside that range into the end caps of the actuators.
4. During actuator replacement, the large size of the actuators requires that the shaking table controls are needed to position the new actuators for hook-up to the foundation and the shaking table. This is a very delicate procedure that requires great care to prevent accidents.
 - Determine exact sub-set of 469D controls to use for actuator installation. This may include only manual hydraulic controls.
 - Verify that the uniaxial control function of the 469D controls works properly.
 - Define operating procedure to communicate actuator movement commands from personnel in the pit and the control room.
 - Carefully restrict possible motion for any move, no matter how large a motion.
 - Constant monitoring of hydraulic supply status to warn personnel of imminent pressure loss that could endanger personnel.
5. A new control system for the multi-pump hydraulic supply system is being installed. This system needs careful checkout and testing to provide quality operation and confidence in these new controls. This site also has a high pressure oil-on-demand system called a Blow-Down system that needs careful checkout to ensure system safety.
 - Test all digital inputs/outputs to electro-mechanical controls of the hydraulic supply system.
 - Test all digital inputs/outputs to control room and 469D Control software.
 - Check out-of-sequence operator actions to prevent accidental change of hydraulic power supply due to operator mistakes.
 - Verify that actual mechanical hydraulic supply start/stop sequences are compatible with the 469D Control software and that all important hydraulic events are reported to the 469D Controller.

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Deliverables, Cont'd:

6. The 469D Control software shall also be upgraded to the latest revisions. Full checkout of the new features is required.
 - Prior to hydraulic startup for the first time, the 469D signal polarities are checked for proper orientation to seismic system standards.
 - Proper servovalve control is tested prior to application of main pressure. This includes tuning and calibration of the servovalves.
 - TVC gains are set for safe levels (low gain condition) and low main pressure is applied. Basic table motions are tested for correct operation. Parking and Normal table positions are verified.
 - High pressure is applied to the table system and 6-DOF TVC tuning proceeds.
 - Special attention is concentrated on new panels and features of the 469D Upgrade. This shall include, but not be limited to –
 - a. Multi-Channel Oscilloscope
 - b. AIC Training Wizard
 - c. Digital Readout Panel
 - d. 3rd-Stage Servovalve Balance Integrators
 - e. Zero of 497 DC Conditioners
7. After actuator attachment to the shaking table, the system shall be re-tuned to normal bare table specifications. Measurements shall be made to verify this tuning process. The 90 degree point of each degree-of-freedom axis shall be specifically measured.
8. There are 3 main sets of acceptance tests required on this project. Bare Table tests and Rigid Body tests shall be performed. These two sets of tests shall be done with sinusoidal commands and flat-spectrum random commands. In addition, there will be Earthquake Record tests to confirm shaking table capability. These tests are a large part of the official acceptance of the work done.
9. Customer training of the new hydraulic controls and shaking table controls are required after system acceptance tests are performed.
10. Provide system engineering support to solve installation problems and assistance to the other sub-job engineers on the project.
11. It is expected that this project shall require six (6) weeks of on-site work to adequately perform the installation, testing, acceptance and customer training functions.

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Deliverables, Cont'd:

There will be three invoices: one for the pre-trip preparation and two invoices for the two three-week trips for this project. The deliverables completed shall be detailed in each invoice:

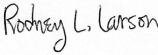
Pre-Trip Preparation Rates/Payment Terms:

Payments	Amounts	When
Deliverable Pre-Trip Documents	\$3000 for 100 hours of pre-trip documentation creation, team approval, production & distribution	Billed after successful completion of documents and distribution or end-of-month

Typical 3-Week Trip Rates/Payment Terms:

Payments	Amounts	When
Deliverable 1 (Week 1)	\$4250 + per diem for five 10-hour day work week + 1 day travel per diem	Billed after successful completion of trip or end-of-month
Deliverable 2 (Week 2)	\$4250 + per diem for five 10-hour day work week	Billed after successful completion of trip or end-of-month
Deliverable 3 (Week 3)	\$4250 + per diem for five 10-hour day work week	Billed after successful completion of trip or end-of-month

Per the Professional Services Agreement, Payments for Invoices are due 15 days after presentation of Invoice.

Presented by:  Digitally signed by
RodneySignature
DN: cn=RodneySignature, o=FEC,
ou,
email=rodlarson100@yahoo.com,
c=US
Date: 2013.05.07 03:02:25 -05'00'
Rodney Larson, FEC LLC

Submitted by: _____
David Kusner, PE