



Quarterly Progress Report

Grant #7310006

Arctic Thermal Shutters and Doors

Arctic Sun, LLC

October 1st, 2014 through December 30, 2014

Deliverables Submitted: The remaining prototype installations at the test locations and the testing, monitoring and data collection took place in this quarter as planned.

Budget: No invoices were submitted for reimbursement since the last quarterly report. Attached is a reimbursement form with back-up for all of the expenditures from September 30th, 2014 through December 30th, 2014 totaling \$16,077.38.

The expenses of this quarter was for additional materials and labor needed for the actual field installation of the prototype shutters at the remaining test location. All expenses are summarized on the attached report titled "4th Qtr 2014 time report." Since inception, \$124,257.20 has been advanced and \$143,426.07 has been expended.

Schedule Status and progress update:

The main focus of this quarter has been to finish all field installations of the test products and get them ready for the winter testing.

1. The Arctic Door progress:

The latest design changes for the Arctic door had been submitted and approved and a new test door has been build and completed and is undergoing field testing.

2. The Blown-in Shutter install:

The prototype is installed at the test location and being monitored and tested successfully and is actively being monitored.

3. The Rigid Shutters:

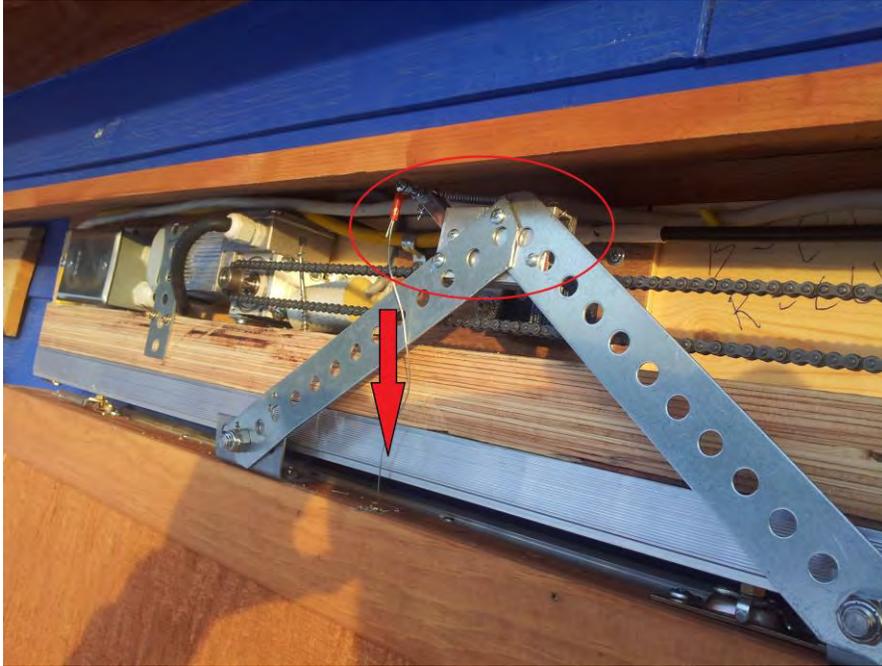
All test shutters are build and installed at the field locations and winter testing is in progress. Some mayor questions and concerns in regards to actual installations and operation needed to be overcome and required a lot of additional time.

Egress windows, Code and Safety:

Since the shutters are in some instances installed in front of egress windows in bedrooms that require safe and secure egress in case of a fire through the window a means to safely slide a shutter is required. Since the shutters are powered by a exterior motor that would not be able to operate in case of a power outage a overriding means to operate the shutters manually in such an emergency situation needed to be developed and implemented. After an endless effort to locate such a means in the existing marketplace we ended up designing and machining a custom piece that allows the shutter to be release manually from the chain drive it is attached to. A stainless steel wire is routed to the inside face of the egress shutter that releases a mechanism at the mount of the shutter to the shutter from the chain drive. This in turn allows for a manual operation of the shutter to clear it from the window opening and allow for safe egress. Obviously this is a crucial safety feature that is imperative. We build and installed four egress releases which are under testing this winter. Finding a commercially available solution

obviously would be still the preference and we are still are on the lookout for such a readily available part.

Installed egress release mechanism:



Track and limiting switch:

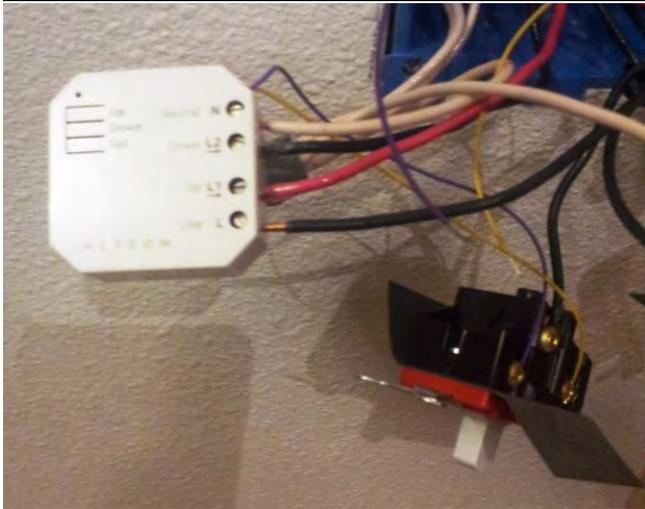


Control and operation strategies:

In this quarter we also researched and developed new control and operation strategies for the shutter installation that provide automated environmentally controlled operation of the

thermal shutters. We implemented a smart controller and switches for the installed shutters that allow for simple “If, When, Then” programming rules on the switching. The controller is linked to local weather stations and environmental rules based on temperature, irradiation, sunset and sunrise and so forth can activate the shutters. This allows for a completely automated implementation of the shutter system. It also allows for the control and monitoring via the internet. Especially for commercial application this allows for a much more refined usage and practical implementation of such a system. The tricky part in this case is the need for a double pole double throw switch that allows for the reverse operation of the motor that requires a “ON | OFF | ON” function. The conventional use of a smart switch is therefore not possible and required a different approach and a use of an inline relay.

INSTEON programmable micro relay in-line with manual switch:



4. Ridged Shutter testing at the LabBox:

The test box is back in operation and the data logged is uploaded to ACEP on a weekly basis. Based on the data produced last year it was decided to increase the logging interval from 5 minutes to 1 Minute, which requires a weekly upload now.



Percent Complete:

Task	Start Date	End Date	Deliverables	Percent Complete
Complete ridged shutter and door design	Jan 2013	April 2013	Design Plans	100%
Complete Blown-in shutter design	Jan 2013	May 2013	Design Plans	100%
Develop plans for testing box and project instrumentation	Jan 2013	May 2013	Testing box design and performance monitoring plans	100%
Construct testing box	March 2013	May 2013		100%
Purchase and delivery of materials for test shutters and doors	March 2013	July 2013		100%
Construct shutters and doors; identify field test site locations	March 2013	Aug 2013	Field test site proposal	100%
Data collection and monitoring on field installations	Febr 2014	March 2015		60%
Final analysis and performance reports; findings published	April 2015	April 2015		0%

Work Progress:

Task 1. Ridged shutter and door design; The final designs were approved.

Task 2. Blown-in shutter design; The final design was approved.

Task 3. Develop plans for testing box and project instrumentation; Arctic Sun's plans for the testing box were approved.

Task 4. Construct testing box; The final design was approved and testing on the Ridged Shutter design is in progress. Test data from the testing is uploaded on a weekly basis to the ACEP Server.

Task 5. Purchase and delivery of materials; All materials for the construction of the field test products has been completed.

Task 6. Construct shutters and doors; identify field test locations; All the field test products have been build and the test locations selected and approved. The prototype rigid shutters have been installed.

Future Work: The data collection, monitoring and test data review of the field installations is ongoing and to be completed by April of 2015 along with the final analysis and the project report.

In Conclusion:

All prototypes have been installed and are being monitored for the final phase of this grant project. New control and operation strategies have been developed and implemented in the field installations. A mild winter so far has not provided ideal testing and we hope that we see some colder temperatures in the remaining month of testing.


Thorsten Chlupp
President, ArcticSun LLC