

ATTACHMENT 1: INVITATION FOR BID UHM-000-010-14

**The Research Corporation of the University of Hawaii
requests bids for the**

PS2 ENCLOSURE WORK: HVAC UPGRADE (PHASE 4)

For the

**Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) Project
Institute for Astronomy
University of Hawaii
Honolulu, HI**

29 May 2014

REVISION HISTORY

Version/Revision	Date	Comments
00	22 April 2014	Initial version released as part of IFB package
01	29 May 2014	Revised version for IFB UHM-000-010-14
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1 REFERENCED DOCUMENTS

Table 1. PSDC Documents

Pan-STARRS ID	Title	Authors
PSDC-350-008	AirGlow Building Conduits and Backup Generator Layout	Morgan and Giebink
PSDC-360-005	PS2 Enclosure Work: Demolition Statement of Work (Phase 1)	Morgan
PSDC-360-008	PS2 Enclosure Work: Power Renovation Statement of Work (Phase 2)	Morgan
PSDC-360-009	PS2 Enclosure Work Renovations Statement of Work (Phase 3)	Morgan

Table 2. PSTD Documents

Pan-STARRS ID	Title	Authors
	N/A for Phase 4	

Table 3. Miscellaneous Project Files

Source Reference	Title	Authors
http://pan-starrs.ifa.hawaii.edu/public/	Pan-STARRS Project Public Web Site	Pan-STARRS

Table 4. External Documents

Source Reference	Title	Authors
M3PN100064	Pan-STARRS PS2 Lure Modifications for the University of Hawaii	M3 Engineering

2 SCHEDULE OF KEY IFB DATES

The schedule of key dates set forth herein represents the RCUH's best estimate of the schedule that will be followed. Any of the dates listed below may be changed at any time at the sole discretion of the RCUH Procurement Officer.

Date of Notice (IFB Issued):	May 29, 2014
Closing Date for Receipt of Offeror Questions:	June 3, 2014, 5 PM HST
Closing Date for Posting Responses to Questions:	June 6, 2014, 5 PM HST
Closing Date for Receipt of Bids:	June 9, 2014, 5 PM HST
Start of Bid Review:	June 10, 2014
Contractor Selection and Award:	June 13, 2014
Services Start Date:	June 30, 2014
Contract completion no later than:	August 22, 2014

3 PAN-STARRS PROJECT OVERVIEW

The University of Hawaii, Institute for Astronomy (IfA), responded to a Broad Area Announcement (BAA) in 2002 by proposing a multi-year program to develop and deploy a telescope and data management system that will provide an extremely comprehensive all-sky digital image survey. This project, the Panoramic Survey Telescope and Rapid Response System or Pan-STARRS, will provide numerous research opportunities at the forefront of astronomy ranging from the structure of the Solar System to the properties of the Universe on the largest scales. A unique combination of wide field of view and time-resolution capability will allow detection of a wide range of transient, variable, or moving objects. In particular, as a primary component of its scientific mission, Pan-STARRS will be able to detect and calculate orbits for large numbers of earth-orbit crossing asteroids, or near earth objects (NEOs), that present a potential threat to mankind. Pan-STARRS represents a significantly increased capability in the area of what is known as “survey astronomy”, the branch of astronomy that maps the sky as completely as possible in order to give a more globally-oriented perspective of objects in our Universe.

The baseline configuration concept for Pan-STARRS is for the system to be composed of four individual optical systems, each with a 1.8 meter diameter mirror observing the same region of sky simultaneously. Thus, Pan-STARRS is a direct realization of the “distributed aperture” concept that combines images from multiple telescopes to provide an image equivalent to that obtained from a telescope with a larger primary aperture. This method leverages the benefits of combining relatively small mirrors with very large digital cameras to be able to develop and deploy an economical observing system with the capability to observe the entire available sky several times each month.

A prototype system, PS1, has been placed at the Pan-STARRS South observatory site on Haleakala, Maui. First Light for PS1 occurred in June 2006 and the telescope was formally dedicated on June 30, 2006. The first of the Pan-STARRS Gigapixel cameras, GPC1, was installed in August 2007, and a dedicated science mission sponsored by an international consortium of institutions began May 13, 2010. Due to the intrinsic nature of a distributed aperture system, PS1 serves as both a standalone system while also potentially representing one quarter of the Pan-STARRS PS4. PS1 has been built to validate many of the features of the full PS4 system including the telescope and camera designs as well as the data reduction software. The lessons learned from the design, construction, and operations of PS1 are also being used to mature the designs for the follow-on Pan-STARRS components. Even as a prototype, PS1 represents a world class research facility beyond what was previously available to the astronomy community.

The next step in Pan-STARRS development was to add a second telescope/camera system, called PS2. PS2 resides at the Pan-STARRS facility’s North site adjacent to PS1. Figure 1 is a photograph showing the PS1 enclosure, the PS2 enclosure, the support building that connects the two enclosures, and the containers that will be used to support

the PS2 mechanicals. The PS2 dome itself was retained and the appearance of the facility after the renovations were completed remains nearly the same as what is shown here. The exceptions are the addition of vents to the skin of the PS2 walls and the addition of an entry stairway between the support building and the PS2 enclosure as shown in Figure 2 and Figure 3. The installation of the PS2 telescope was completed in May 2013.

In preparation for the enclosure renovations, the Pan-STARRS Project initiated a contract with M3 Engineering, located in Tucson, Arizona, for the development of the architectural, structural, and electrical drawings for all of the PS2 dome renovations. These designs and this drawing set were completed in August 2011. These drawings supply most of the detailed descriptions for the tasks required in this package. For programmatic reasons, it was decided to break up the renovation effort into separate phases. The tasks described in this IFB represent a sub-set of the tasks outlined in the M3 drawings.

There are four phases to the PS2 enclosure renovations. The first phase (PSDC-360-005) consisted of the demolition and dome preparation work. The second phase (PSDC-360-008) consisted of the tasks needed to re-configure the power feed and cooling into both the PS1 and PS2 enclosures to make them compatible with the mountaintop-wide changes that have already occurred during the construction of the Daniel K. Inouye Solar Telescope (DKIST) (formerly known as the Advanced Technology Solar Telescope or ATST). The third phase (PSDC-360-009) consisted of the tasks required to complete all of the PS2 enclosure interior renovations and renovations to the Support Building except for the final tasks required to complete the HVAC upgrade. The fourth and final phase, the Phase 4 HVAC upgrade, consists of completing the installation of the chiller upgrades, installation of remaining mechanicals such as the fan coil units and ductwork in the PS2 observatory, replacement of certain glycol lines in the Support Building, and bringing the completed HVAC system to a fully operational online status.

Most of the piping required for the HVAC mechanicals has already been installed during the Phase 3 efforts. Figure 4 shows the existing FC-1 piping as it is currently terminated near the planned location of this fan coil unit. Figure 5 shows the termination near the location planned for FC-2. However, some of the piping work for the HVAC mechanicals still remains to be done and will be part of the Phase 4 effort. For instance, a segment of the main chilled water supply and return lines in the Support Building need to be upgraded to larger diameter pipes. These insulated pipes are seen at the top of Figure 6 (see drawing MP101 for a description of this pipe replacement work).

With this RFP, the RCUH requests bids from qualified vendors to accomplish Phase 4 of the PS2 Observatory Renovations, the HVAC upgrade work. The selected vendor will be issued an Agreement for Services with the Research Corporation of the University of Hawaii for the Scope of Work described in Section 4 of this document.

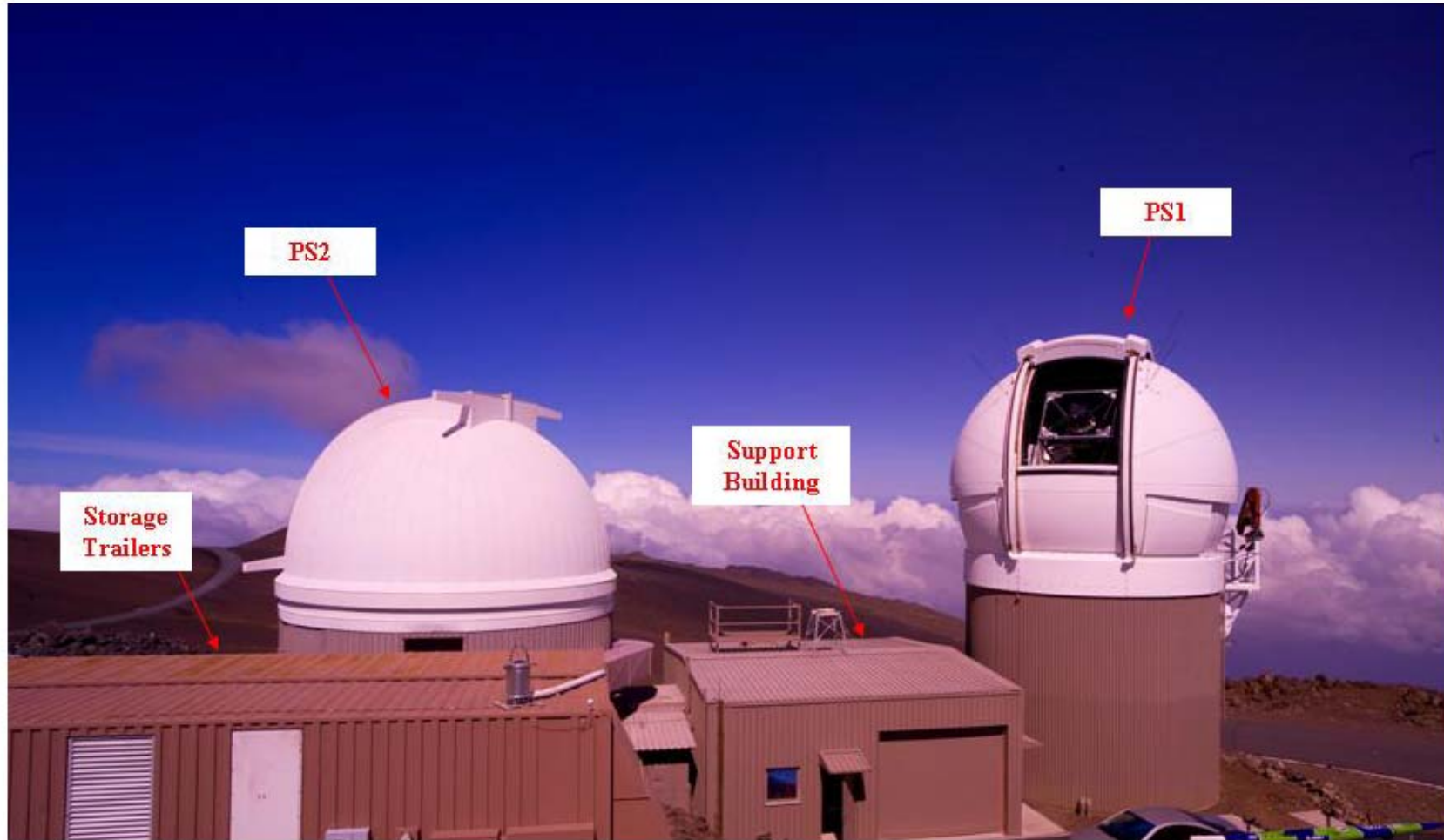


Figure 1. The PS2 and PS1 Domes



Figure 2. The new stairway from the PS2 catwalk to the Pan-STARRS driveway.



Figure 3. The new exterior panels and vent doors after the completion of Phase 3.

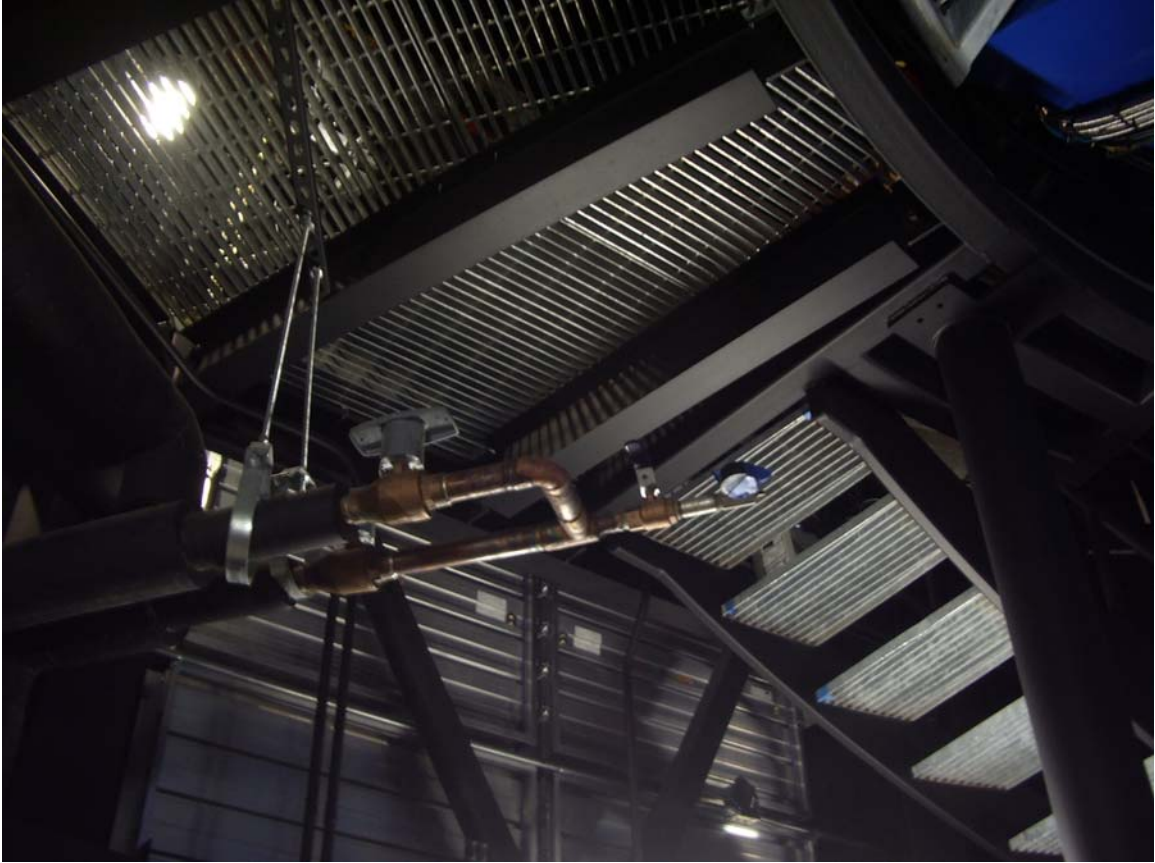


Figure 4. The existing termination of the FC-1 piping.



Figure 5. The existing termination of the FC-2 piping.



Figure 6. The support building chilled water lines that need to be replaced are shown near the top of this photo (see drawing MP101).

4 THE SCOPE OF WORK

The tasks described here are given as details and keynotes in the drawing package entitled “Pan-STARRS PS2 Lure Modifications for the University of Hawaii”, which was produced by M3 Engineering (M3 Engineering reference number M3PN100064). This Attachment 1 document defines the subset of tasks from that drawing package that represents the Phase 4 work. Since there are no substantial time and space savings that come from excluding drawings relevant to only Phases 1-3, we have placed the complete drawing set in the folder labeled “Phase 4 Drawings” on the CD-ROM containing the Bid Package for IFB UHM-000-010-14. Thus, this folder contains PDF copies of all of the drawings listed in Table 6 of Section 5, but with information relevant to Phase 4 being color-coded in ORANGE.

Section 5 of this document details the tasks that this phase of the work package includes. In this section we describe only the major milestones that are involved in this effort as well as other general considerations.

This bid shall include all technical support documentation for the proposed renovation work, bid pricing, and time estimates for the Phase 4 tasks detailed in this document. Costs shall include line item details such as shipping estimates, non-recurring costs, number and types of personnel proposed for on-site installation work, and labor costs for each major segment of the project.

Table 5 is a list of the fabrication milestones associated with this bid and its resultant contract. **Part of the vendor's bid efforts will be to propose dates for all of the milestones in this table given the desired starting and end dates for this phase of the renovation.**

The Project will be responsible for initial site preparation for this work. This will be detailed below in Section 5.2. The Project has already obtained the permits required to accomplish this work on Haleakala. However, part of the permitting process requires contractors and subcontractors who bring commercial vehicles through the National Park to register those vehicles under the PS2 renovation permit. This registration requires each vehicle that will go through the Park to be inspected. There is an inspection fee of approximately \$150 that the contractor must pay to the National Park. Multiple cars can normally be inspected at once for the same fee, and as long as cars are not driven off-road at other sites, they will not normally require multiple inspections. The car registration permits expire after about 6 months. Details of this process will be explained further to the winning bidder. **Because failure by a subcontractor to adhere strictly to the rules and policies regarding driving through the National Park can result in the IfA's general permit being revoked, it is extremely important that subcontractors understand there is ZERO TOLERANCE policy in effect for any violations. Written acknowledgment and agreement to adhere to the rules by the awarded subcontractor will be required.**

Table 5. Interior Renovation Milestones

Task Number	Milestone Description	Completion Date
1	Contract Start Date	June 30, 2014
2	The A/C control system (EMCS) documentation is delivered for review.	To Be Proposed
3	The A/C air handlers and ductwork are installed	To Be Proposed
4	Valves in North dome for camera-facility glycol	To Be Proposed
5	Electrical panel wiring for Panel DB-2 is completed	To be Proposed
6	The Airstack chiller expansion module is installed	To Be Proposed
7	The glycol lines are replaced in the Support Building	To Be Proposed
8	Dome A/C is tested	To Be Proposed
9	Site is cleaned up and secured for weather	To Be Proposed
Completion Date For All Tasks Should Be No Later Than		August 22, 2014

During the Phase 4 work it is important that vendors understand that they are working inside a building containing an operational telescope (PS2) that is currently being tested at night as well as next to an operational telescope facility (PS1). It is critical that all Phase 4 work be conducted to ensure the safety of all equipment currently inside the PS2 observatory. It is as important to keep disruptions to the operations of the PS1 telescope to a minimum; this is especially relevant for the task to replace 1 ½" glycol line segments in the Support Building by 2" glycol lines.

There are eight (8) long-lead items required for this work that the Project will take responsibility for providing: the Airstack expansion module, the Airstack Buffer tank, the air handling units (2), duct defrost heaters (2), and recirculation pumps (2). The list of owner-provided/contractor installed items is given later in Section 5.2 (Table 8)

5 DEFINITION OF INCLUDED TASKS

5.1 Vendor tasks defined

As mentioned in Section 4, all material in the Bid Package for IFB UHM-000-010-14 is contained on the CD-ROM. Drawings listed below in Table 6 are contained in the “Phase 4 Drawings” folder on the CD-ROM. The drawings listed in this table are the complete set of available architect drawings for all four phases of the renovation work, but **the tasks that are specific to Phase 4 have been color coded in ORANGE**. The firm responsible for the development of the drawings given in Table 6 is M3 Engineering, and while most of the drawings in this package do not contain any tasks that will be done during Phase 4, all drawings are included there for reference and completeness.

Table 6. M3 Drawings Relevant to Phase 4

Sheet Count	Drawing Number	Drawing Title
General Drawings		
1	GI001	Cover Sheet
2	GI002	Abbreviations, Material and Keying Symbols, Location Map
Architectural Drawings		
3	AR301	Building Section A-A
4	AR302	Building Section B-B
Mechanical Drawings		
5	MH001	HVAC General Notes
6	MH101	Mechanical Floor Plan
7	MH301	HVAC Mechanical Section
8	MH501	HVAC Details
9	MH601	HVAC Schedules

10	MH701	HVAC Chilled Water Schematic
11	MH702	HVAC Control Notes and Sequence
12	MP101	HVAC Mechanical Piping Plan
Electrical Drawings		
13	E001	Electrical Symbols, Abbreviations, and General Notes
14	E002	Electrical Specifications
15	ES101	Electrical Site Plan
16	EP101	Electrical Power Plan
17	EP601	Electrical Plan Schedules, Sheet 1

Table 7 itemizes the subset of tasks from the M3 drawing package that are included in the scope of work for this phase. These tasks, along with relevant general notes are what have been color coded **ORANGE** in the drawings listed in Table 6. This task list is not in chronological order of the tasks; vendors are free to modify the order of work as they see fit. Instead, this task list is organized into four “work packages”. Also note that the drawings, plus Table 7, define the full scope of work for Phase 4

We require bidders to provide us with line-item costs for each of the four packages listed below.

Within each work package, the tasks are organized in order of the sheet drawing index found on sheet GI002. The packages given in Table 7 are as follows:

1. The installation of the enclosure electrical and mechanical HVAC units, including valves and final hook-ups to the Campbell chiller in Container #2.
2. The installation of the Airstack expansion module and buffer tank.
3. The replacement of glycol lines in the Support Building.
4. End-to-end testing and balancing of HVAC system in PS2

It should be understood here that each task listed may have unlisted sub-tasks that are required to accomplish the listed tasks. It is part of the vendor’s responsibility in bidding for this work to identify and take into account such subtasks. It is possible that some tasks that are prerequisites for items listed here will have been accomplished by earlier Project efforts.

In Section 5.2 we have attempted to make clear what we see as prerequisite tasks that are the Project's responsibility. The Project will work with the vendors in trying to clarify any such points, but it is the vendor's responsibility to define and account for all subtasks required to effectively complete the tasks listed in Table 7.

The task list given below in Table 7 refers to several pieces of hardware that are to be Owner-Furnished/Contractor-Installed (OFCI) items. In Section 5.2, Table 8 we define explicitly what hardware shall be OFCI for Phase 3 of this renovation.

Table 7: PS2 Interior Renovations, Phase 4 Tasks

Task Number	Task description	Drawing reference	Keynote reference
1. Enclosure HVAC electrical and mechanical work			
1	Install HVAC units (FC-X) and ductwork including defrost heaters (DH-X), recirculation pumps (HP-X), condensate drains and glycol lines from Airstack chiller.	AR301 (AR302) (MH101) (MH301) (MH501) (MH601) (MH701) (MH702) (MP101) (EP101)	17 (17) (5, 8-9, 11) (1, 2, 4-6) (details 1-2 & 4-6) - - - (5) (6-8)
2	Install air handler temperature sensor	MH101	10
3	Verify hook-ups for Campbell chiller in Container #2	-	-
4	Complete hook-ups for panel DB-2	EP601 (ES101) (EP701)	10 4 (3)
5	Install HVAC controls for PS2 enclosure.	MH701 (MH101)	Control Notes, 17-18 12
2. Airstack expansion module installation			

6	Install OFCI Airstack expansion module. (But, note that the Project will deal with modifications to the chiller pad if these are necessary)	MH601 (MH501) (MH701) (MP101) (ES101)	Chiller Sch. Note 5 (detail 7) Control Notes, 1.1 (4) (11)
7	Install OFCI Airstack buffer tank module and associated valves to chiller lines.	MH601 (MH501) (MH701)	Buffer Tank Sch. (detail 7) -
3. Support Building modifications			
8	Replace glycol lines in Support Building	MP101	7
4. End-to-end system test and balancing			
9	Charge system with glycol mixture	MH701	Control Notes, 21
10	Balance flows to and from FC-1 and FC-2	MH001	11950 Testing adjusting and balancing, 1-5
11	Test defrost cycles on FC-1 and FC-2	MH701	Control Notes, 19
12	Test system alarms	MH701	Control Notes, 14-16 Fan Coils FC-1 and FC-2, 2, 5, 6f, 9, & 10
13	Test set point controls	MH701	Control Notes, 11-12
14	Test system logs	MH701	Control Notes, 15-16
15	Test space temperature stability	MH701	15900 – Controls, 1.2
16	Test operation of Campbell chiller	-	-

5.2 Project preparation for Phase 4 work

Prior to the start of this phase of the PS2 dome renovation, the Project will accomplish the following tasks:

1. The camera electronics chiller lines will be installed. A flow meter will be provided on the LCC to measure glycol flow. Note that
 - The camera electronics require a 1 gal/min flow rate at the height of the telescope fork,
 - The camera electronics chiller lines will tie into the HVAC glycol lines at the lines that currently are stubbed out inside the enclosure just under the catwalk.
2. The Campbell chiller will be drained of all glycol.
3. Expand the small concrete pad to accommodate the additional Airstack module
4. All of the Phases 1-3 tasks have been completed. These tasks included all of the electrical and mechanical infrastructure for the new HVAC system, including glycol line installation, up to the point where these lines interface to the air handlers, FC-1 and FC-2 (see Figure 4).

There are several Owner-Furnished/Contractor Installed (OFICI) items for the Phase 4 tasks. These are listed in Table 8. Some of these items such as the Airstack expansion module (MH601, Chiller Schedule Note 5) and the Air Handling Units (AR301, k.n. 17) are long-lead items, and have been acquired ahead of time to facilitate the Phase 4 schedule.

Table 8. Owner-Furnished/Contractor-Installed (OFCI) items for Phase 4

Item Number	Item Description	Manufacturer	Part Number	Number of Items Provided
1	Air handling unit FC-x (BCXC Blower Coil Air Handler)	Trane	BCHC090E1**A3G06P00 0000B01000000000000000	2
2	Defrost heaters DH-x	Keltech	HL183/208	2
3	Recirculation pumps HP-x	Bell & Gossett	PL-30	2
4	Airstack Expansion Module	Airstack	ASP-15A(SR)	1
5	Chiller System Buffer tank	Hanson	WL-264-B	1