Woodside Sellman Project Items

WRNS STUDIO Design Team Cooling Strategy and Air Conditioning

November 4, 2016

The team has visited the site and engaged our mechanical, electrical and structural engineer to come up with the following.

Interface Engineers spent several weeks working with various vendors to help establish the most efficient and cost effective approach to adding in the cooling system. They have confirmed through field measurements and discussions with the vender, that the insertion of the cooling coils is tight but not inadvertently difficult according to the manufacturer Carrier. For the purposes of efficiency, durability, accommodation of the building space restraints, and good acoustics (the unit is right behind the stage and ducted under the stage for supply and over the stage for return), a custom unit was selected in lieu of an off the shelf package unit, which did not seem appropriate for this project since it doesn't come with the aforementioned attributes. Efficient AHUs are commonly custom (they are built to the specifications needed for the project) as are their components. With the advancement of systems, this is not an unusual condition, so the claim by a previous sub to CPM stating that the location of the AHU results in a custom cooling coil is a non sequitur and needs to be separated from the issue we are attempting to solve.

Interface provided a proposed **BASE design** using a 25-ton chiller. Marked up plans and cutsheet have been provided. Recommendations on two options for the components are identified below as they improve performance and can reduce operational costs.

The following describes manufacturer pricing information on equipment necessary to provide cooling to the existing air handler. Once decisions are made regarding the chiller options, the design can be finalized.

The equipment needed for the Base Design cooling retrofit are: (noted costs are approximate and provided from the vendor on the equipment only)

Air cooled chiller with 25 tons of capacity (Carrier 30RAP); approximately 88" wide, 40" deep, and 73" tall. The unit is 1405#, and the curb can be sleepers. Chiller cut sheet which indicates 8 mounting points (4 per side).

Two chilled water cooling coils.
Piping from the chiller to the coil may be installed with PEX instead of copper to further reduce materials cost.

Chiller Options:

- Second Pump – $1,200

  The chiller comes with an integral pump already installed. A second pump may be added to provide redundancy. This is typically done where any downtime on the chiller would be unacceptable. It is our recommendation to skip this second pump as the event of a failure of the pump would be extremely rare and easily replaced in the future.

- Variable Speed Condenser Fan – $2,400

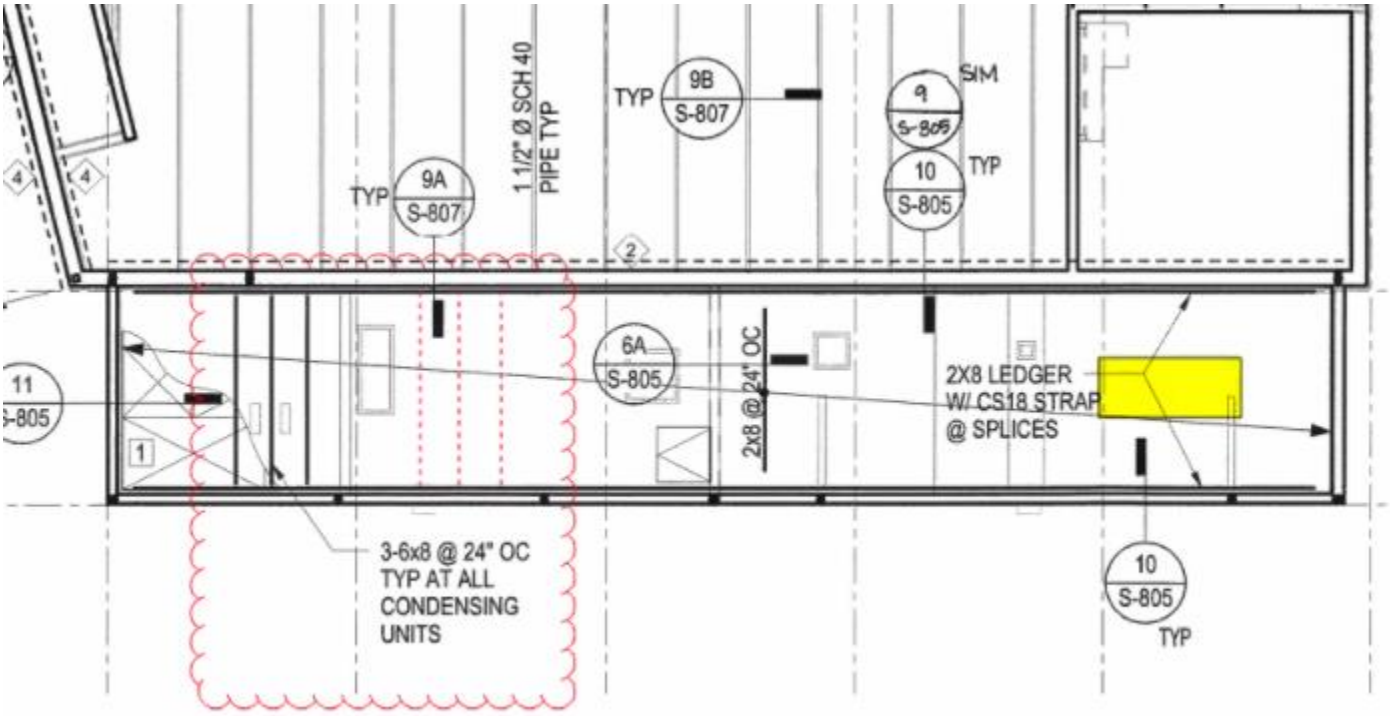
  By default, the chiller has constant speed condenser fans, which run at full speed regardless of the load on the chiller. This means that whenever the chiller sees a call for cooling, the fans ramp up to maximum capacity, even if the cooling load is small. This causes a waste of energy and runs the chiller at the loudest condition whenever it's called to run. It is recommended that this feature be added to the chiller.

Structural has reviewed the mechanical design and indicates that the addition of the chiller will result in the need to reinforce the gravity system (i.e. strengthening of roof joists and adding blocking) given the new location. Potentially we could accomplish this by sistering new 2x's to the existing joists. The particulars will be worked out during design once the location of the chiller is confirmed. We believe that the most cost effective way to access the structural members if from the roof top which would mean reroofing the portion removed. The original design required the increase in

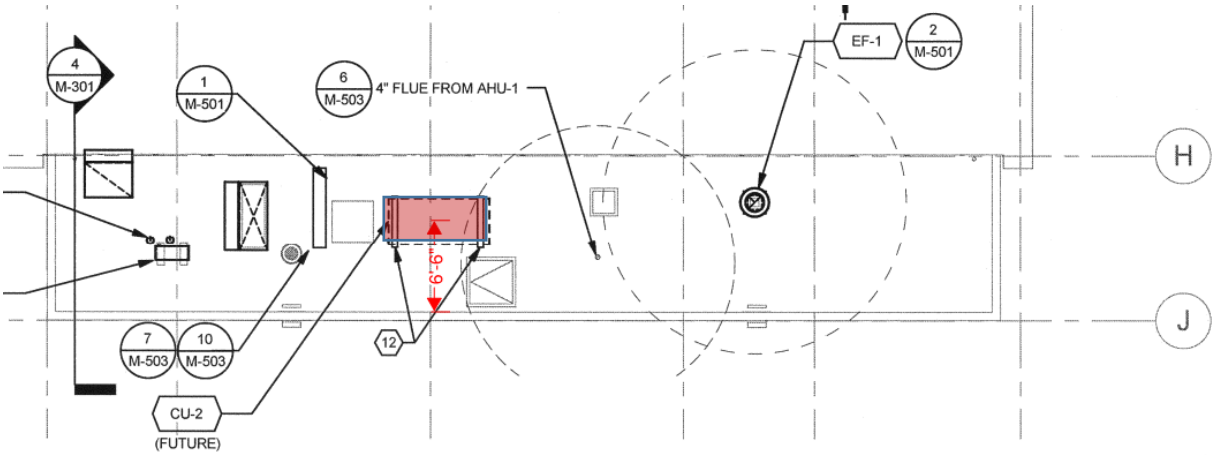
strengthening only below the condensing units (to minimize costs). Given that the unit was moved, it is unclear if added structure was included in the new location identified during Construction Administration and noted as “Future Cooling Unit”. See Structural diagram of existing condition below

Electrical has power shown in the mechanical well for future CU so that should be very minimal.
We have the conduit already in the previous scope of work, so the power add would just be for the wiring, breaker, and final connections to the new equipment.

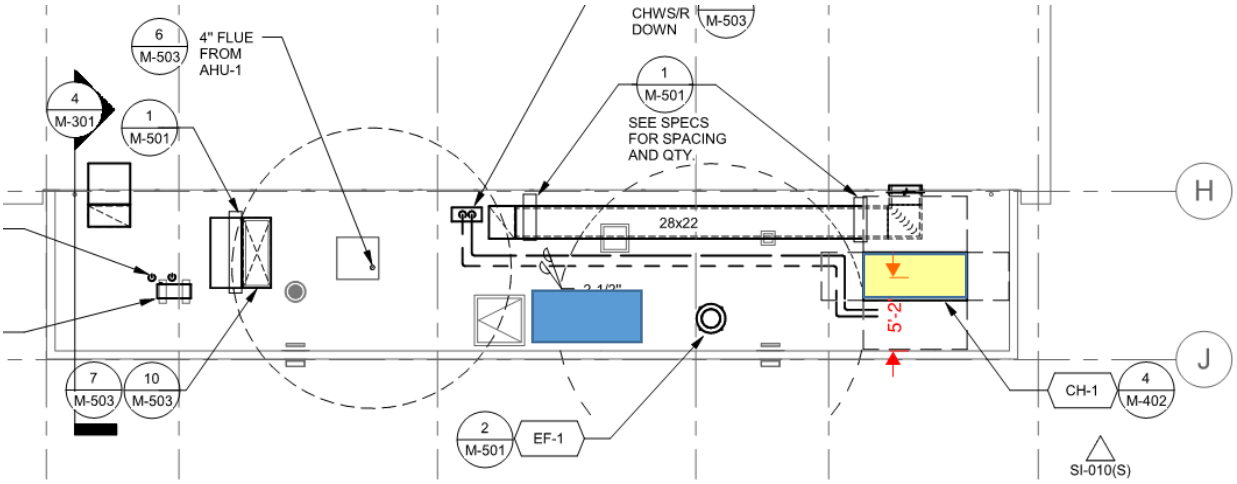
Original Structural Design
Our original design included a requirement for larger support beams at locations of any condensing units. If these beams were installed at the new chiller location, then we will be fine. However, I suspect that is not the case, and the existing framing will need to be strengthened. Alternatively, chiller should be moved to location where the beams were installed, i.e. the location previously identified as “future condensing unit”.

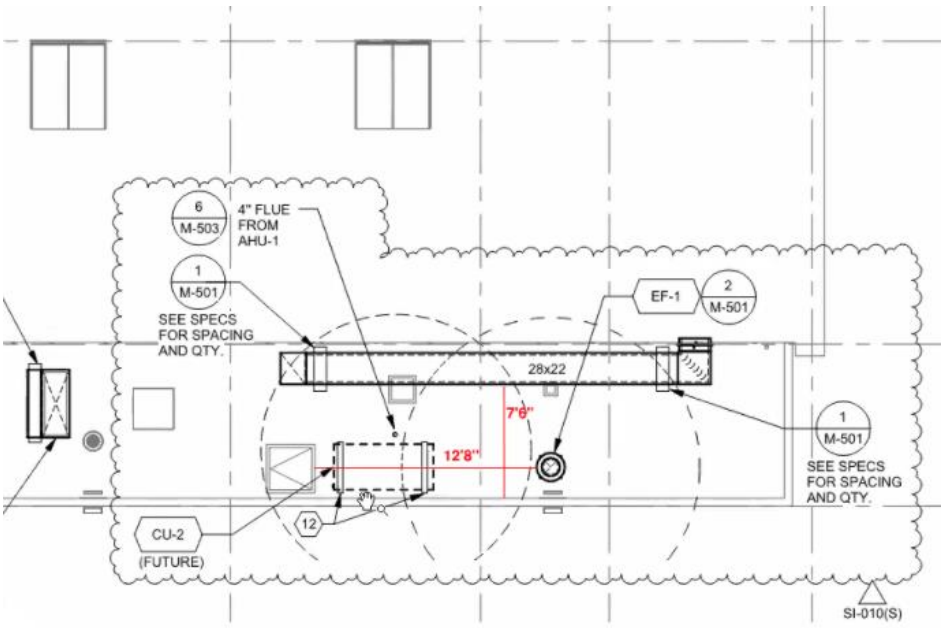


Original BOD (before relocation) : red box is shown as designed



Proposed new location: blue box is revised CA location based on CA input; yellow box is current suggested location





Duct to roof tied to RFI 204 item 2 on 10/1/2015. Clear dimension of duct is
28 “x18” vs 30” x 20 (insulated section);
There was reported clearance by XL of both 14” clear depth and 17” clear, so the duct could not fit.
CU-2 is the unit in question now. And the current, proposed design calls for a 1400 lb unit instead of the 1100 lb one.

RFI 204: 10/2015

Received from: Jennifer Seeley (XL Construction)
Question:
Please see the following Items that we need the Engineer in Record to advise and provide instruction/direction:
Sheet M-201 is attached with Item number location for clarification.

1) 50"x18" Supply air duct discharge has a conflict with 4x4 post, which is approx. 6' from mechanical room. Please advise how to extend the ductwork passing thru this post.

2) 28"x18" R/A duct does not fit in space. Clear dimension of duct with 1"-insulation will be 30"x20". There is 17" clear depth over boys and girls bathroom & 14" clear depth between both bathrooms. If we decide to run the ductwork over the roof due to ceiling space restrictions, Future CU-2 & EF-1 need to be relocated. Please advise.

3) MD-3, 4 & 5 are 20 round damper which can not be installed if duct work is 50"x18" (see #4). Please advise.

4) Please confirm per conversation with Jesse (Interface) to run 50"x18" supply air duct in lieu of 48"x22".

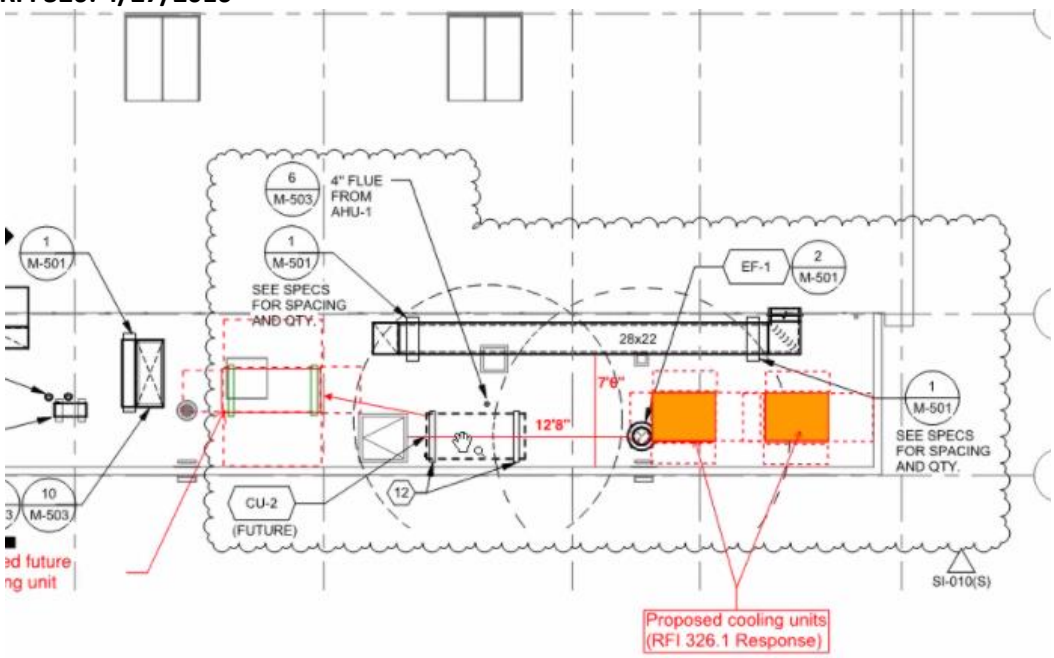
5) Return air duct between G&H, J&H/2, 3 & 4 is too close to the wall and there is not enough room to hang duct per SMACNA standard. min. 4-6" clear space is required for starp/support.

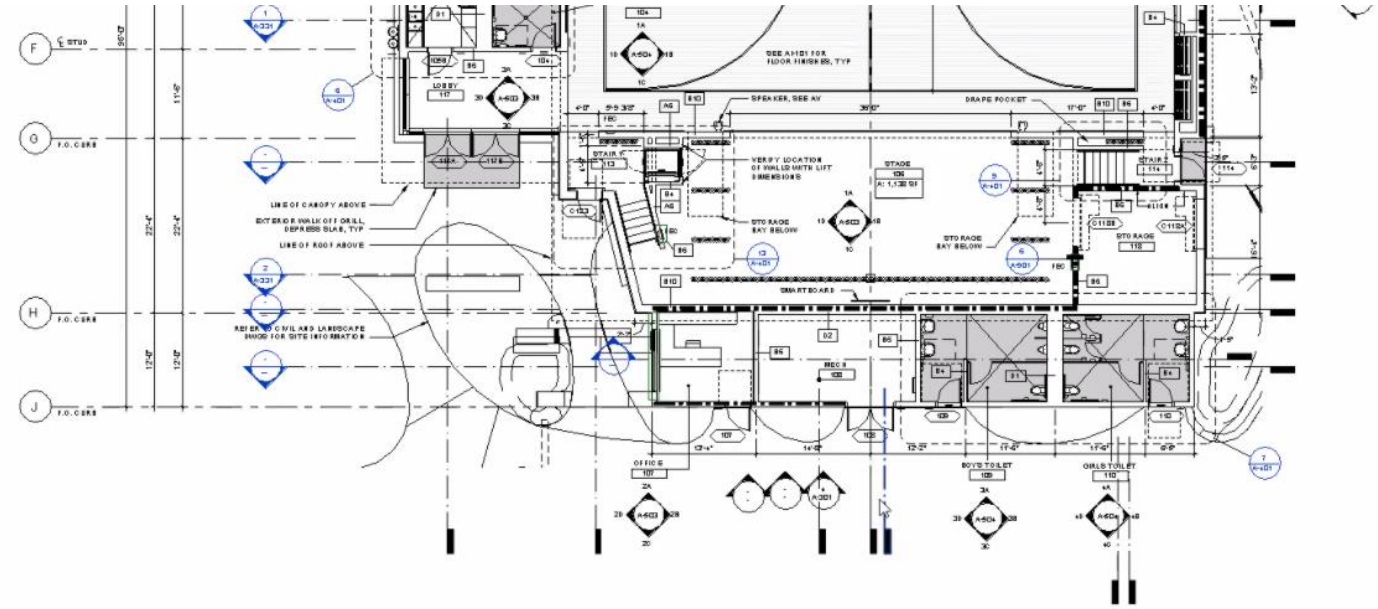
6) Note No. 5 on sheet M-201, range hood discharge to hood. What size? Please advise.

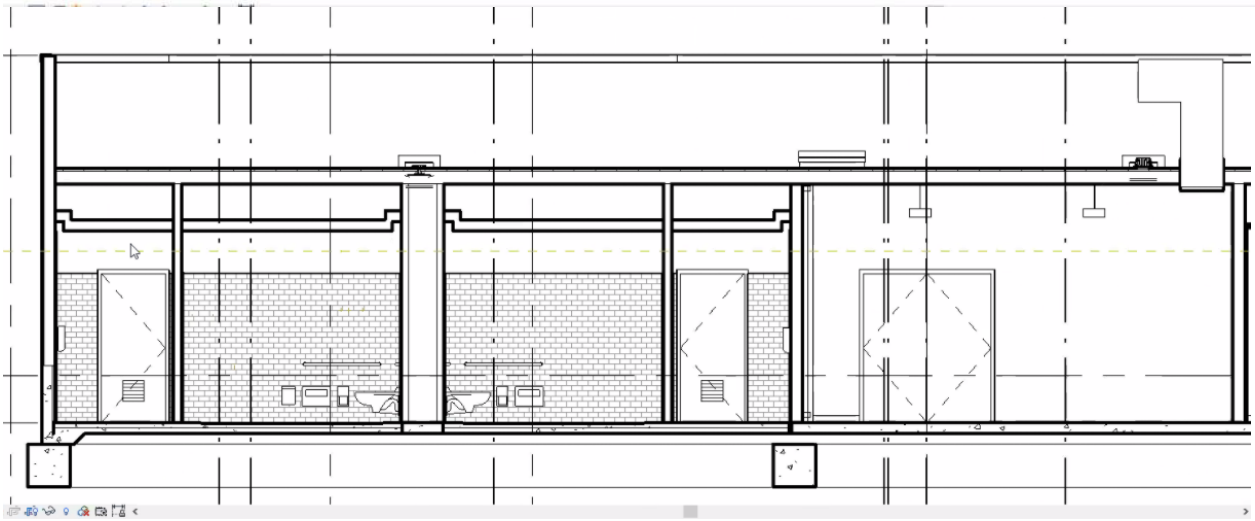
7) What size grille are in the kitchen and toilet 104? There are no sizes or schedule. Please advise.

8) 60"x24" outside air duct over air handler 3/Mechanical room Enlarged plan does not show insulation. Is it requited to have insulation? If yes, how many inch? Please advise

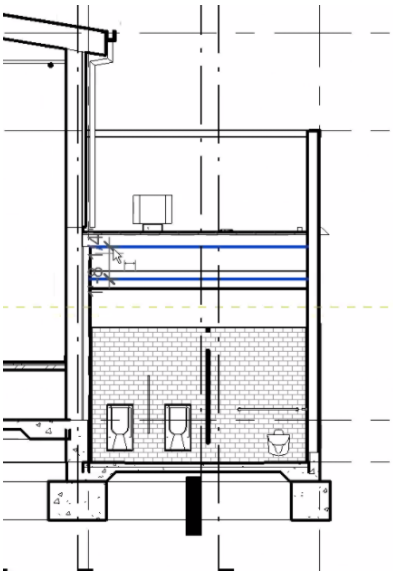
RFI 326: 4/27/2016



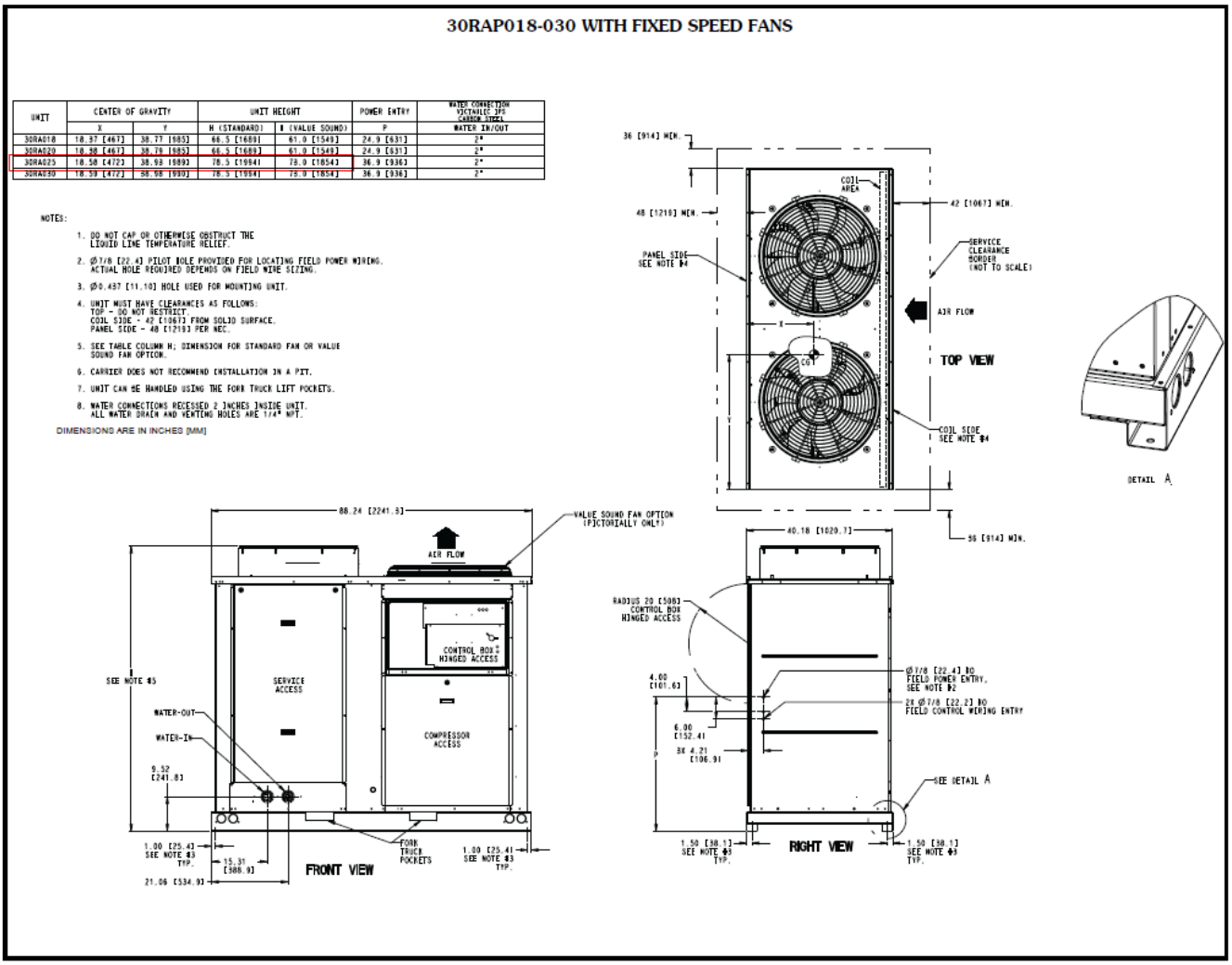




Looking south



1’-8 ¼” clear



UNIT	CENTER OF GRAVITY		UNIT HEIGHT		POWER ENTRY	WATER CONNECTION VICTAULIC 3FS CARBON STEEL
	X	Y	H (STANDARD)	H (VALUE SOUND)	P	WATER IN/OUT
30RA018	18.37 [467]	38.77 [985]	66.5 [1689]	67.0 [1549]	24.9 [631]	2"
30RA020	18.38 [467]	38.76 [985]	66.5 [1689]	67.0 [1549]	24.9 [631]	2"
30RA025	18.58 [472]	38.93 [989]	78.5 [1994]	78.0 [1854]	36.9 [936]	2"
30RA030	18.59 [472]	38.98 [990]	78.5 [1994]	78.0 [1854]	36.9 [936]	2"

Base unit dimensions — 30RAP018-030

The design team does not agree with CPM’s assessment that the full design of a cooling system was required contractually given the unfolding of the design and the discussions and decisions during the design process. What we do agree with is the development of a system that should accommodate added cooling with a reasonable amount of investment. We had agreed that the project could provide a comfortable condition during the seasons as reasonably forecasted by weather trends and good practice – this was always the correct

target. From our assessment of the days that have been identified as uncomfortable in 2016, and from our assessment of how the systems works otherwise during the year, it appears the designed system works as intended except for the days out of trend. We recognize, however, that the day in question was extremely uncomfortable, and though an anomaly, was not acceptable to those in attendance. Given budget concerns during the design process and estimating, it was decided and agreed upon by all that in lieu of having a full mechanical cooling system, the design would be developed to accommodate the possibility of adding a mechanical cooling component to the base system later on, should it be desired. This initial elimination of the cooling coils and condensing unit saved money in construction cost and should be saving money in operation cost currently. Developing permit drawings that illustrates the needed addition after construction and performing Construction administration was not included. In the interest of assisting the District, Interface Engineers has agreed to not charge the District for the design work and due diligence with the vendor community they have performed to describe the next steps for the system.

REVISED PROPOSED FEE: Fee for designing new system, and providing necessary documentation is as follows: (assumes XL Construction working with Woodside School District).

Interface: ~~$5,400.00 design~~ $2,400 construction

TT: $1200.00 - $2000 depending on if project is a CCD or under a new project

Previous information provided

WRNS Studio design team analysis 10.06.16 v3

1) ADDING AIR CONDITIONING TO SELLMAN

The project multi- purpose space was designed for the programmed uses and the fluctuation in occupants due to those uses. Such uses included sports events, sport practice sessions, performance sessions, educational sessions and the annual Operetta. All events were a part of the programming and included such details as occupant load (how many people), variations in occupant load, frequency of use and time of use (month and days, and time of day). It was known that the Operetta would likely be the largest peak load and likely be experiencing seasonal temperatures of approximately 75- 78 degrees during the day in early June, with evening hours at 68-71 degrees.

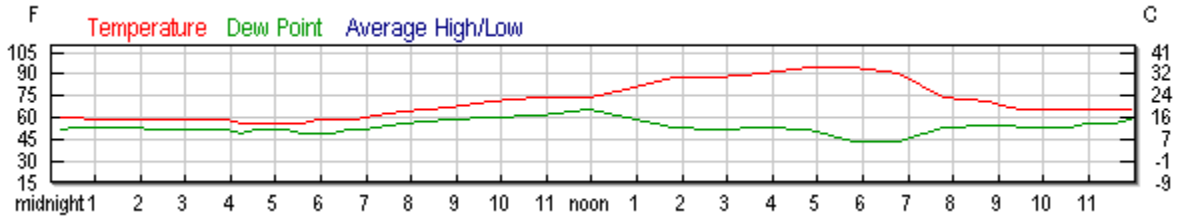
As such, it was anticipated that the current design would be able to accommodate the forecasted temperature. This approach also reduced the projected hard cost (based on estimates) for the project at that time by about $50 – 70K.

Operetta occurred in 2016:

- June 1 @ 5:30 was 73.4F
- June 2 @ 7:00 was 77F
- June 3 @ 7:00 was 91.4F
- June 4 @ 7:00 was 71.6F

<u>See below for historic data and next steps for inclusion of the Air Conditioning.</u>

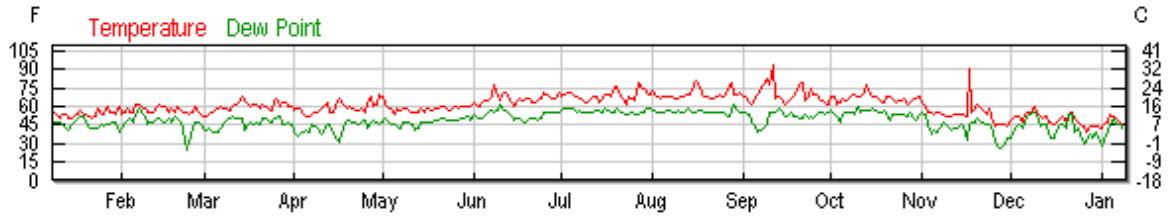
June 3, 2016:



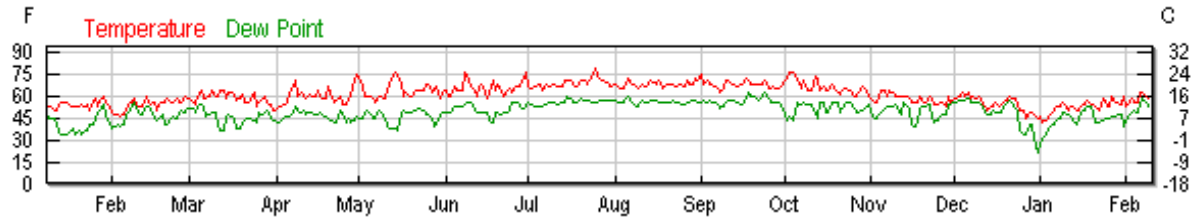
All days except the 1st and 4 were reasonably warm. The 3rd must have been unbearably warm.

HISTORICAL REFERENCE

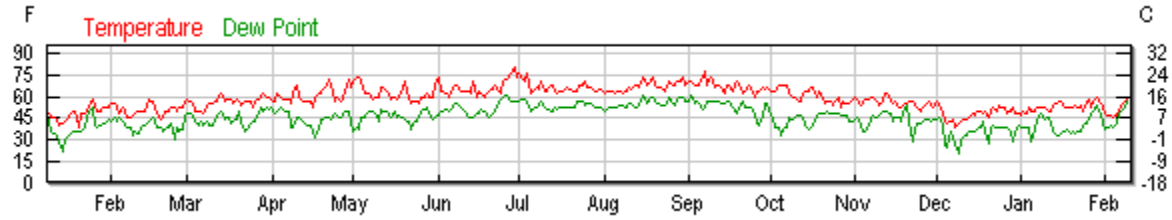
<u>2015-2016</u>



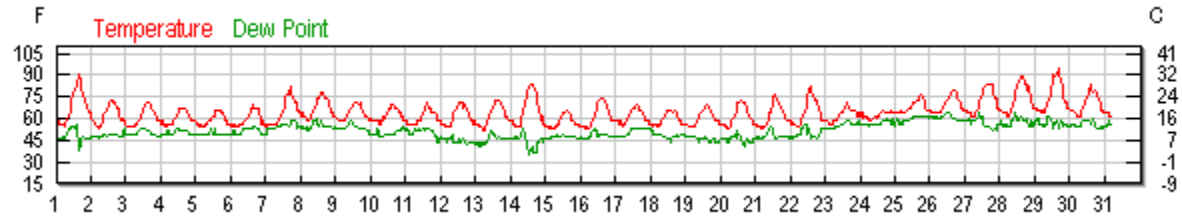
2014-2015



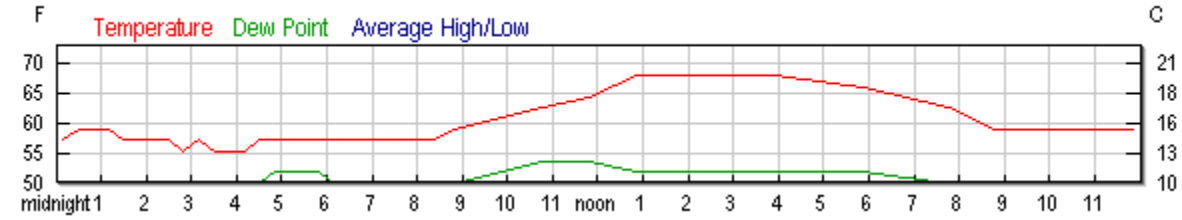
2013-2014



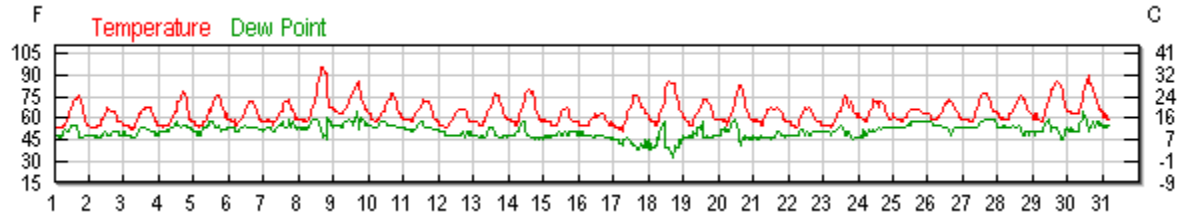
June 2013



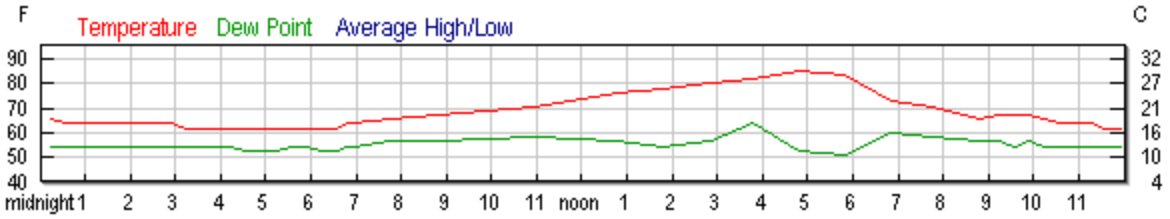
June 1, 2013:



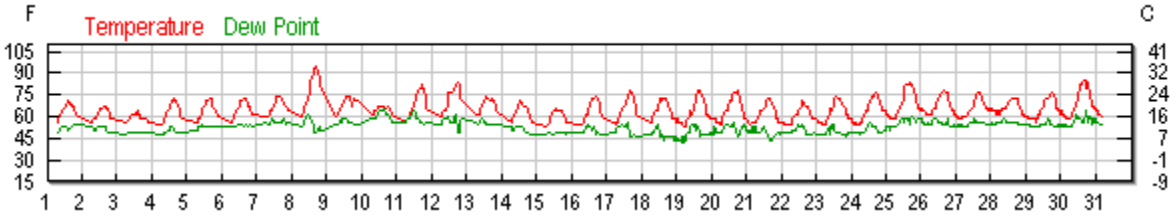
June 2014



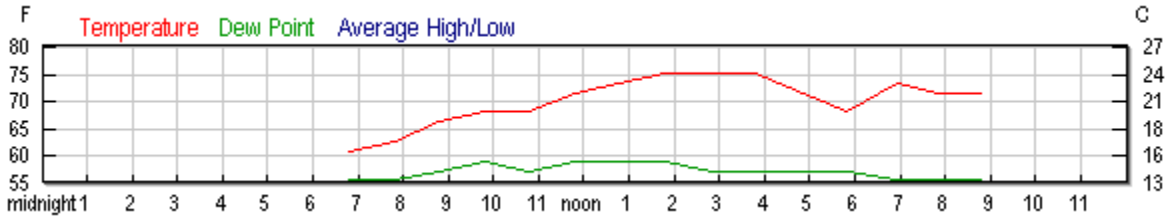
June 9, 2014:

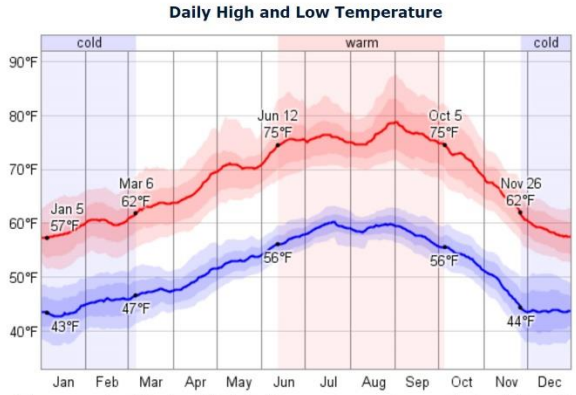


June 2015



June 8, 2015

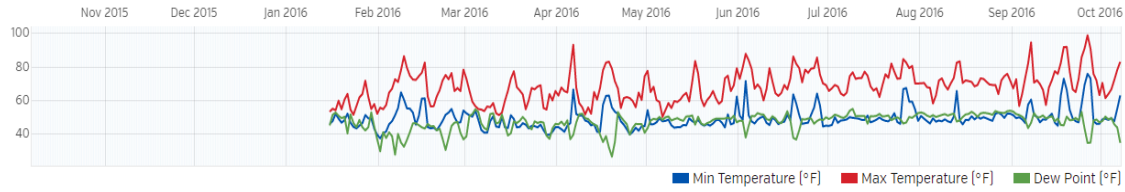




The daily average low (blue) and high (red) temperature with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

Weather History for Woodside, CA [KCAWOODS41]

Weather History Graph
October 7, 2015 - October 7, 2016



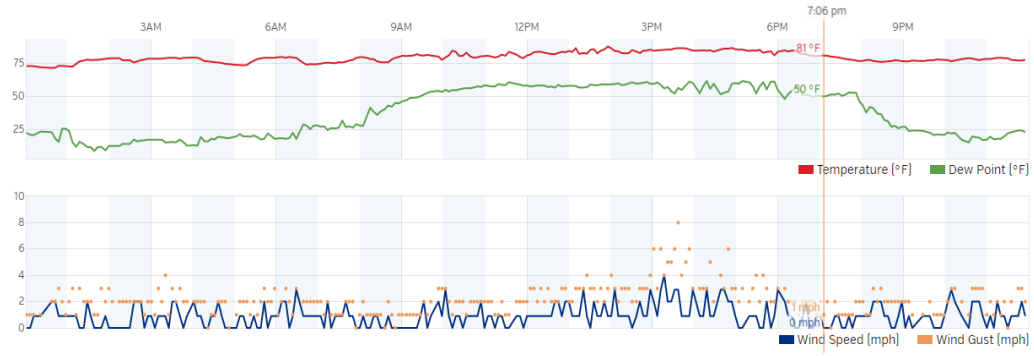
Summary
June 3, 2016

	High	Low	Average
Temperature	87.8 °F	71.6 °F	79.7 °F
Dew Point	61.7 °F	8.8 °F	38.1 °F
Humidity	51%	7%	26%
Precipitation	0 in	--	--

	High	Low	Average
Wind Speed	4 mph	--	1 mph
Wind Gust	8 mph	--	--
Wind Direction	--	--	WSW
Pressure	29.95 in	29.84 in	--

Graphs | Table

Weather History Graph
June 3, 2016



Most days will not hit the temperatures experienced this year in June.

In order to accommodate future events and the flexibility to add in cooling, the base project has been designed to accommodate the addition of cooling integrated into our current system.

ACTION: UPDATING SYSTEM
To add the cooling the following will need to be provided (assumes no DSA work, assumes work with XL Construction):

1. Add Condensing Unit pads (CU Curbs) for the condensing units. These were previously included in the base bit and removed due to construction issues, and then credited back to the owner.
2. Add two CU's (two 12 ton). Anticipated to be two and located on the lower flat roof.
3. Add piping to connect to the units
4. Adequate power is accommodated in the electrical panel

We looked at using one condensing unit or two and have determined that two would be best to do two at this time. There should be a credit for the curbs that originally were to be placed on the lower roof flat ceiling. RFI 326 – CU Curbs: was generated because of a construction revision to routing of ductwork serving the stage/auditorium. The new location of ductwork on the roof of the mechanical well eliminated the location identified for future cooling unit. XL provided a credit back to the school for the curbs that were never installed. WRNS is not aware of the dollar value credited.

PROPOSED FEE: Fee for designing new system, and providing necessary documentation is as follows:
(assumes XL Construction working with Woodside School District)
Interface: $5,400.00 design $2,400 construction
TT: $1200.00