# Prefunctional Checklist

Project _____

## PC-_____ PACKAGED DX AIR CONDITIONING or HEAT PUMP, ID_____

**Components included:** __supply fans, ___return & exhaust fans, ___coils, ___valves, ___VFD, ___dampers, ___compressors, ___condensers

Associated Checklists: _____

## 1. Submittal / Approvals

**Submittal.** The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsible contractor. This prefunctional checklist is submitted for approval, subject to an attached list of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding areas. None of the outstanding items preclude safe and reliable functional tests being performed.___ List attached.

| | | | |
|---|---|---|---|
| _____ Mechanical Contractor | _____ Date | _____ Controls Contractor | _____ Date |
| _____ Electrical Contractor | _____ Date | _____ Sheet Metal Contractor | _____ Date |
| _____ TAB Contractor | _____ Date | _____ General Contractor | _____ Date |

Prefunctional checklist items are to be completed as part of startup & initial checkout, preparatory to functional testing.

- This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report.
- Items that do not apply shall be noted with the reasons on this form (N/A = not applicable, BO = by others).
- If this form is not used for documenting, one of similar rigor shall be used.
- Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.
- "Contr." column or abbreviations in brackets to the right of an item refer to the contractor responsible to verify completion of this item. A/E = architect/engineer, All = all contractors, CA = commissioning agent, CC = controls contractor, EC = electrical contractor, GC = general contractor, MC = mechanical contractor, SC = sheet metal contractor, TAB = test and balance contractor, ____ = _____.

**Approvals.** This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted below.

| | | | |
|---|---|---|---|
| _____ Commissioning Agent | _____ Date | _____ Owner's Representative | _____ Date |

Notes:

## 2. Requested documentation submitted

Check if Okay. Enter comment or note number if deficient.

| Check | Equip Tag-> | | | | | | Contr. |
|---|---|---|---|---|---|---|---|
| Manufacturer's cut sheets | | | | | | | |
| Performance data (fan curves, coil data, etc.) | | | | | | | |
| Installation and startup manual and plan | | | | | | | |
| Sequences and control strategies | | | | | | | |
| O&M manuals | | | | | | | |

***Documentation complete as per contract documents for given trade ___ YES ___ NO***

## 3. Model verification

1 = as specified, 2 = as submitted, 3 = as installed. Enter information and check if Okay. Enter note number if deficient.

| Equip Tag---> | | | | | | |
|---|---|---|---|---|---|---|
| Manuf. | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| Model | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| Serial # | 3 | | | | | |
| Cooling Capacity | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| S Fan Capacity | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| R/E Fan Capacity | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| VFD or Inlet vanes | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |

- ***The equipment installed matches the specifications for given trade.....___ YES ___ NO***

## 4. Installation Checks

Check if Okay. Enter comment or note number if deficient.

| Check | Equip Tag-> | | | | | | Contr. |
|---|---|---|---|---|---|---|---|
| **Cabinet and General Installation** | | | | | | | |
| Permanent labels affixed, including for fans | | | | | | | |
| Casing condition good: no dents, leaks, door gaskets installed | | | | | | | |
| Access doors close tightly - no leaks | | | | | | | |
| Boot between duct and unit tight and in good condition | | | | | | | |
| Vibration isolation equipment installed & released from shipping locks | | | | | | | |
| Maintenance access acceptable for unit and components | | | | | | | |
| Sound attenuation installed | | | | | | | |

Notes:

Check if Okay. Enter comment or note number if deficient.

| **Check** **Equip Tag->** | | | | | | **Contr.** |
|---|---|---|---|---|---|---|
| Thermal insulation properly installed and according to specification | | | | | | |
| Instrumentation installed according to specification (thermometers, pressure gages, flow meters, etc.) | | | | | | |
| Clean up of equipment completed per contract documents | | | | | | |
| Filters installed and replacement type and efficiency permanently affixed to housing | | | | | | |
| **Piping and Coils** | | | | | | |
| No leaking apparent around refrigerant fittings | | | | | | |
| All coils are clean and fins are in good condition | | | | | | |
| All condensate drain pans clean and slope to drain per spec | | | | | | |
| OSAT, MAT, SAT, RAT sensors properly located and secure (related OSAT sensor shielded) | | | | | | |
| Sensors calibrated (See calibration section below) | | | | | | |
| If split system, refrigerant piping in good condition and suction insulated | | | | | | |
| P/T plugs and isolation valves installed per drawings | | | | | | |
| **Fans and Dampers** | | | | | | |
| Supply fan and motor alignment appear correct | | | | | | |
| Supply fan belt tension & condition good | | | | | | |
| Supply fan protective shrouds for belts in place and secure | | | | | | |
| Supply fan area clean | | | | | | |
| Supply fan and motor properly lubricated | | | | | | |
| Return/exhaust fan and motor aligned | | | | | | |
| Return/exhaust fan belt tension & condition good | | | | | | |
| Return/exhaust fan protective shrouds for belts in place and secure | | | | | | |
| Return/exhaust fan area clean | | | | | | |
| Return/exhaust fan and motor lube lines installed and lubed | | | | | | |
| Filters installed and replacement type and efficiency permanently affixed to housing--construction filters removed | | | | | | |
| Filter pressure differential measuring device installed and functional (magnahelic, inclined manometer, etc.) | | | | | | |
| Smoke and fire dampers installed properly per contract docs (proper location, access doors, appropriate ratings verified) | | | | | | |
| All dampers close tightly | | | | | | |
| All damper linkages have minimum play | | | | | | |
| Low limit freeze stat sensor located to deal with stratification & bypass | | | | | | |
| Motors: premium efficiency verified, if spec'd? | | | | | | |
| **Compressor and Condenser** | | | | | | |
| Refrigerant sight glass clear of bubbles (if OSAT > 70F) | | | | | | |

Notes:

Check if Okay. Enter comment or note number if deficient.

| **Check** **Equip Tag->** | | | | | | **Contr.** |
|---|---|---|---|---|---|---|
| Moisture indicator shows no moisture | | | | | | |
| Correct oil level (check site glass during operation) | | | | | | |
| Compressors and piping were leak tested, as required | | | | | | |
| Crankcase heater on when unit is off | | | | | | |
| Condenser coils clean and in good condition (air cooled) | | | | | | |
| Adequate clearance for airflow around condenser | | | | | | |
| **Ducts** (preliminary check) | | | | | | |
| Sound attenuators installed | | | | | | |
| Duct joint sealant properly installed | | | | | | |
| No apparent severe duct restrictions | | | | | | |
| Turning vanes in square elbows as per drawings | | | | | | |
| OSA intakes located away from pollutant sources & exhaust outlets | | | | | | |
| Pressure leakage tests completed | | | | | | |
| Branch duct control dampers operable | | | | | | |
| Balancing dampers installed as per drawings and TAB's site visit | | | | | | |
| **Electrical and Controls** | | | | | | |
| Pilot lights are functioning | | | | | | |
| Power disconnects in place and labeled | | | | | | |
| All electric connections tight | | | | | | |
| Proper grounding installed for components and unit | | | | | | |
| Safeties in place and operable | | | | | | |
| Current overload heaters installed and correct size | | | | | | |
| Auxiliary heaters installed | | | | | | |
| Sensors calibrated (see section below) | | | | | | |
| All building control system interlocks hooked up with packaged controls and functional | | | | | | |
| Fire and smoke detectors in place | | | | | | |
| Enthalpy control and sensor properly installed (if applicable) | | | | | | |
| Related thermostats are installed | | | | | | |
| Related building automation system points are installed | | | | | | |
| All control devices, pneumatic tubing and wiring complete | | | | | | |
| | | | | | | |
| **VFD** | | | | | | |
| VFD powered (wired to controlled equipment) | | | | | | |
| VFD interlocked to control system | | | | | | |
| Static pressure or other controlling sensor properly located and per drawings and calibrated (see Section 6) | | | | | | |
| Static pressure or other controlling sensor calibrated | | | | | | |

Notes:

Check if Okay. Enter comment or note number if deficient.

| Check Equip Tag-> | | | | | | Contr. |
|---|---|---|---|---|---|---|
| Drive location not subject to excessive temperatures | | | | | | |
| Drive location not subject to excessive moisture or dirt | | | | | | |
| Drive size matches motor size | | | | | | |
| Internal setting designating the model is correct | | | | | | |
| Motor FLA setting represents 100% to 105% of motor FLA rating | | | | | | |
| Appropriate Volts vs Hz curve is being used | | | | | | |
| Accel and decel times are around 10-50 seconds, except for special applications. Actual decel:_____, Accel:_____ | | | | | | |
| Lower frequency limit at 0 for VAV fans. Actual: _____ | | | | | | |
| Upper frequency limit set at 100%, unless explained otherwise | | | | | | |
| Unit is programmed with full written programming record submitted | | | | | | |
| RPM readout in BAS verified with VFD readout | | | | | | |
| **TAB** | | | | | | |
| Installation of system and balancing devices will allow balancing to be done per specified NEBB or AABC procedures & contract docs | | | | | | |
| **Final** | | | | | | |
| Smoke and fire dampers and unpowered TU's are open? | | | | | | |
| Safeties installed and safe operating ranges for this equipment provided to the commissioning agent | | | | | | |
| Functional test procedures for this equipment reviewed and approved by installing contractor | | | | | | |
| If unit is started and will be running during constructdion: have quality filters on RA grills, etc. to minimize dirt in the ductwork and coils and in any finished areas. Verify moisture migration is not a problem due to improper pressures between spaces. | | | | | | |

- ***The checklist items of Part 4 are all successfully completed for given trade.___ YES ___ NO***

## 5. Operational Checks (These augment mfr's list. This is not the functional performance testing.)

Check if Okay. Enter comment or note number if deficient.

| Check Equip Tag-> | | | | | | Contr. |
|---|---|---|---|---|---|---|
| Supply fan rotation correct | | | | | | |
| Return / exhaust fan rotation correct | | | | | | |
| No unusual noise or vibration in supply and exhaust fans | | | | | | |
| Condenser fan rotation correct (air cooled) | | | | | | |
| Condenser fan acceptable noise and vibration (air cooled) | | | | | | |
| Measure line to line voltage imbalance for 1/3 of the compressors:<br>Compressor 1 Phase: (%Imbalance = 100 x (avg. - lowest) / avg.) Record in cell, all three phase voltages. Imbalance less than 2%? | | | | | | |
| Compressor 2 Phase: (%Imbalance = 100 x (avg. - lowest) / avg.) Record in cell, all three phase voltages. Imbalance less than 2%? | | | | | | |

Notes:

Check if Okay. Enter comment or note number if deficient.

| Check Equip Tag-> | | | | | | Contr. |
|---|---|---|---|---|---|---|
| Record full load running amps for each compressor. _____rated FL amps x _____srvc factor = _____ (Max amps). Running less than max? | | | | | | |
| Record full load running amps for each condenser fan. _____rated FL amps x _____srvc factor = _____ (Max amps). Running less than max? | | | | | | |
| Fans > 5 hp Phase Checks:<br>(% impalance = 100 x (avg. - lowest) / avg.)<br>List fan & record all 3 voltages in cell. Imbalance less than 2%? | | | | | | |
| Record full load running amps for each fan. _____rated FL amps x _____srvc factor = _____ (Max amps). Running less than max? | | | | | | |
| Inlet vanes aligned in housing, actuator spanned, modulate smoothly and proportional to input signal and EMS readout. | | | | | | |
| All dampers (OSA, RA, EA, etc.) stroke fully without binding and spans calibrated and BAS reading site verified (follow procedure in Calibration and Leak-by Test Procedures). List dampers checked: _____ | | | | | | |
| Valves stroke fully and easily and spanning is calibrated (follow procedure in Calibration and Leak-by Test Procedures). List each actuated valve here when spanned: _____ | | | | | | |
| Valves verified to not be leaking through coils when closed at normal operating pressure (follow procedure in Calibration and Leak-by Test Procedures). | | | | | | |
| The HOA switch properly activates and deactivates the unit | | | | | | |
| Safeties installed and safe operating ranges for this equipment provided to the commissioning agent | | | | | | |
| Specified sequences of operation and operating schedules have been implemented with all variations documented | | | | | | |
| Specified point-to-point checks have been completed and documentation record submitted for this system | | | | | | |
| Startup report completed with this checklist attached | | | | | | |

- ***The checklist items of Part 5 are all successfully completed for given trade.___ YES ___ NO***

## 6. Sensor and Actuator Calibration [ ]

All field-installed temperature, relative humidity, CO, $CO_2$ and pressure sensors and gages, and all actuators (dampers and valves) on this piece of equipment shall be calibrated using the methods and tolerances given in the Calibration and Leak-by Test Procedures document. All test instruments shall have had a certified calibration within the last 12 months: Y/N_____. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

Notes:

| Sensor or Actuator & Location | Loc-ation OK | **1st** Gage or BAS Value | Instr. Meas'd Value | **Final** Gage or BAS Value | Pass Y/N? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| Sensor & Location | Loc-ation OK | **1st** Gage or BAS Value | Instr. Meas'd Value | **Final** Gage or BAS Value | Pass Y/N? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Gage reading = reading of the permanent gage on the equipment. BAS = building automation system. Instr. = testing instrument. Visual = actual observation. The Contractor's own sensor check-out sheets may be used in lieu of the above, if the same recording fields are included and the referenced procedures are followed.

- ***All sensors and actuators are calibrated within required tolerances .....___ YES ___ NO***

**-- END OF PROCEDURES--**

Notes: