GENERAL:

1. The purpose of this design guide is to:
   1.1. Standardize the types and quality of compressed air provided that is considered part of the facility systems.
   1.2. Standardize both the type of air compressor used and the installation details to facilitate the operation and maintenance of air compressors.
   1.3. And is applicable to all air compressors serving building HVAC, fire protection or central laboratory systems.

DESIGN GUIDELINES:

1. Types of air. University facilities may typically have 3 types of air. These are:
   1.1. Control air. Utilized for HVAC control systems
   1.2. Lab Air. Utilized for general laboratory work.
   1.3. Medical air. Utilized in hospitals and vet facilities.

2. Compressed Air Provided. The facility air compressor or the campus wide compressed air loop will provide lab air and control air. If medical air is required, it is the responsibility of the department to provide and maintain this compressor. All medical air systems shall be separate and independent of the facility system.

3. The facility air compressor or compressed air loop will provide Lab air and control air of the following minimum quality in accordance with ISO 8573.1 "Air Quality Classes",

	ISO QUALITY CLASSES	***MEASUREMENT***
SOLIDS (IN MICRONS)	1	0.1 Micron
WATER (DEWPOINT)	4	37.4 °F
OIL (PPM)	3	0.8 ppm

The contaminant levels in this table are the maximum allowed per ISO class.

4. Filters.

   4.1. Lab air and Control air systems shall be provided with the following:
   4.2. A pre-filter located between the air compressor and the refrigerated air dryer with a minimum filtration of 3 micron particulates and 5 ppm oil.
   4.3. A final filter located between the air dryer and the pressure regulators with a minimum filtration of .01 micron particulates and .01 ppm oil.

5. Dryers. Lab air and control air shall be provided with an air dryer capable of 37.4°F dewpoint. Control air that will be routed to an exterior location shall be provided with a small desiccant air dryer capable of -4°F dewpoint. Route condensate/drip line to nearest

floor drain.

6. Sizing. Compressed air sizing shall be based on generally accepted methods, using 1 scfm per lab outlet and applying a diversity factor based on the number of probable outlets in use.

7. Run time. The compressor shall be selected to provide a 30% run time based on a single compressor running. Duplex compressors shall be selected such that the combined run time shall not exceed 30%.

8. Air compressors shall be located in accessible locations for maintenance. A minimum 3 ft access space in front of serviceable belts, machine guards, oil reservoirs and electrical components shall be provided. Location shall not expose staff to other hazards such as hot piping, or heights. Route condensate/drip line to nearest floor drain.

9. All compressors shall be provided with a house keeping pad.

10. Vibration isolators shall be provided. Slab on grade may utilize rubber cork pads.

11. Installations on upper level floors should be analyzed for vibration and spring isolators/inertia pads provided if necessary.

12. Provide piping vibration isolators between compressor and fixed piping.

13. Compressors should be simplex / Duplex, alternating design, as directed by the project manager.

14. Power and Controls. On duplex compressors, provide a power circuit for each compressor motor and a separate power circuit for the controls.

15. Submittals should include catalog data, certified sound power ratings, Motor ratings and electrical characteristics plus motor and fan accessories. Shop drawings from the manufacturer detailing dimensions, weights, required clearances, components, and location and size of each field connection for each product specified

16. Close out manuals should include both Installation and Operations and Maintenance Manuals

SPECIFICATION REQUIREMENTS:

1. Typical codes, standards and warrantees shall apply and as indicated below:

   1.1. Provide a simplex/(duplex) tank mounted, two stage, reciprocating air compressor complete with tank, motors, drives and controls as specified herein.

1.1.1. Capacity	SCFM @ 125 psig
1.1.2. Tank size	Gallons
1.1.3. Motor HP	HP
1.1.4. Compressor RPM	RPM (maximum)
1.1.5. Electrical Service	_____Volts/3 PH/60Hz

1.2. Compressor

1.2.1. Crankcase shall be one piece cast iron construction. A crankcase with separate, removable oil pan will not be acceptable.
1.2.2. Valve assemblies shall be disc and spring type which do not require the removal of the head for replacement. Reed type valves are not acceptable.
1.2.3. Crankshaft bearings shall be tapered roller type and shall be serviceable without disassembly of the unit. Bearing rated L_{10} life shall be a minimum 20,000 hours. Journal type bearings are not acceptable.
1.2.4. Compressor shall have a large crankcase oil reservoir with an oil sight glass for visual verification of oil level.
1.2.5. Cylinders shall be finned for heat dissipation.
1.2.6. Cylinder heads and cylinder shall be 1-piece design.
1.2.7. First stage piston shall be aluminum. Second stage piston shall be cast iron.
1.2.8. Each cylinder shall contain 4 rings, three compression rings and one oil ring
1.2.9. Piston rods shall be die-cast aluminum alloy.
1.2.10. Pressure relief valve shall be located at interstage and discharge
1.2.11. Fin tube intercoolers shall be provided between stages.
1.2.12. Fin tube aftercooler shall be provided between the pump and receiver, integral to the flywheel assembly.
1.2.13. Flywheel shall have fan wheels for additional compressor cooling.
1.2.14. Crankshaft shall be ductile iron crankshaft.
1.2.15. Maximum compressor RPM is 800.

1.3. Tank

1.3.1. Receiver tank shall be a horizontal steel tank, ASME rated with ASME relief valve.
1.3.2. Provide tapping for drain test cock.
1.3.3. A base shall be welded to the tank to secure the compressor and motor. The base shall slots to adjust alignment between motor and flywheel.

1.4. Motors. Alternating current, Squirrel Cage Induction Motor, Design B conforming to NEMA MG-1 Motors shall be selected for the capacity indicated. Motors shall not operate in the service factor. and as follows:

1.4.1. High Efficiency, Greater than 94%
1.4.2. Constant speed, 1750 RPM, Intermittent Duty
1.4.3. Insulation System: Class F
1.4.4. Enclosure and Method of Cooling: Open Drip Proof (ODP).
1.4.5. Service Factor 1.10 for 3 phase motors
1.4.6. Integral Thermal Overloads.
1.4.7. Bearings shall be ball bearings or cylindrical roller bearings and grease lubricated.
1.4.8. Bearing Life: L-10 of 30,000 hrs.
1.4.9. Terminal Box must meet or exceed NEMA standards.
1.4.10. Provide drain holes at low point in motor.
1.4.11. All hardware shall be Corrosion resistant.

1.4.12. Provide lifting bolts on frame sizes over 180T.
1.4.13. Motor nameplate shall be stamped, 304 stainless steel and securely fastened to motor.
1.4.14. Motor shall be dynamically balanced.

1.5. Electrical and Controls.

1.5.1. Compressor shall be purchased without the factory control panel. MU Maintenance department shall furnish a control panel for each compressor on the project for the contractor to install.

1.5.2. Separate electrical service shall be provided to each compressor along with a separate 120 volt control circuit

1.6. Accessories

1.6.1. Low-resistance intake air filter; central station air filter rated of 97% efficiency rated air flow.
1.6.2. Provide an OSHA approved belt guard on unit.
1.6.3. Pressure Switch. Provide a 120 volt pressure switch to control on/off cycling.
1.6.4. Pressure Gauge. Provide a minimum 0 - 200 psig pressure gauge on the discharge piping.