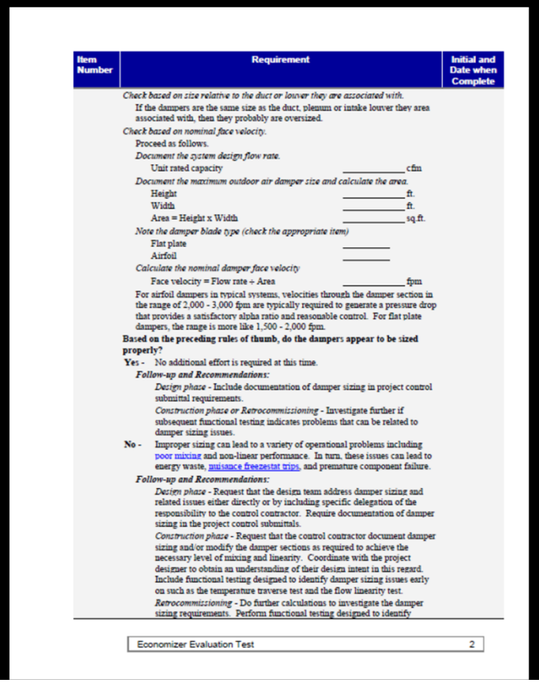
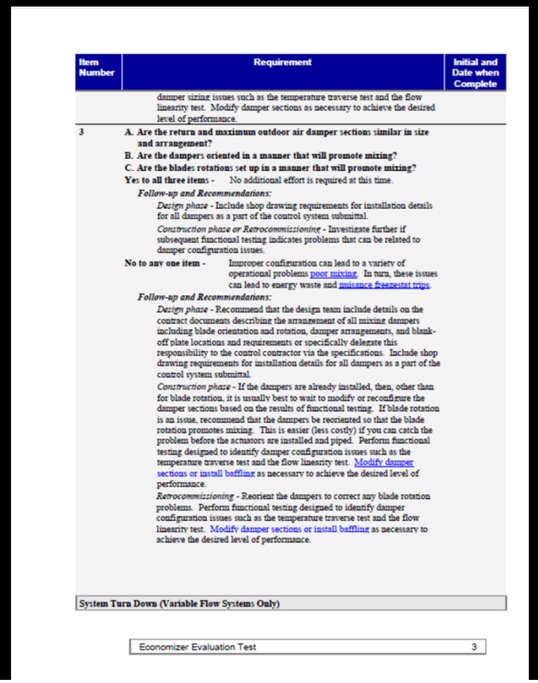
Break Out 02

Given

1. The second section of the checklist
2. Previous information
3. Damper curves that follow



Item Number	Requirement	Initial and Date when Complete
	Check based on size relative to the duct or louver they are associated with. If the dampers are the same size as the duct, plenum or intake louver they ares associated with, then they probably are oversized. *Check based on nominal face velocity.* Proceed as follows. *Document the system design flow rate.* Unit rated capacity _____ cfm *Document the maximum outdoor air damper size and calculate the area.* Height _____ ft. Width _____ ft. Area = Height x Width _____ sq.ft. *Note the damper blade type (check the appropriate item)* Flat plate _____ Airfoil _____ *Calculate the nominal damper face velocity.* Face velocity = Flow rate ÷ Area _____ fpm For airfoil dampers in typical systems, velocities through the damper section in the range of 2,000 - 3,000 fpm are typically required to generate a pressure drop that provides a satisfactory alpha ratio and reasonable control. For flat plate dampers, the range is more like 1,500 - 2,000 fpm. **Based on the preceding rules of thumb, do the dampers appear to be sized properly?** **Yes -** No additional effort is required at this time. ***Follow-up and Recommendations:*** *Design phase* - Include documentation of damper sizing in project control submittal requirements. *Construction phase or Retrocommissioning* - Investigate further if subsequent functional testing indicates problems that can be related to damper sizing issues. **No -** Improper sizing can lead to a variety of operational problems including poor mixing and non-linear performance. In turn, these issues can lead to energy waste, nuisance freezestat trips, and premature component failure. ***Follow-up and Recommendations:*** *Design phase* - Request that the design team address damper sizing and related issues either directly or by including specific delegation of the responsibility to the control contractor. Require documentation of damper sizing in the project control submittals. *Construction phase* - Request that the control contractor document damper sizing and/or modify the damper sections as required to achieve the necessary level of mixing and linearity. Coordinate with the project designer to obtain an understanding of their design intent in this regard. Include functional testing designed to identify damper sizing issues early on such as the temperature traverse test and the flow linearity test. *Retrocommissioning* - Do further calculations to investigate the damper sizing requirements. Perform functional testing designed to identify	



Item Number	Requirement	Initial and Date when Complete
	damper sizing issues such as the temperature traverse test and the flow linearity test. Modify damper sections as necessary to achieve the desired level of performance.	
3	**A. Are the return and maximum outdoor air damper sections similar in size and arrangement?** **B. Are the dampers oriented in a manner that will promote mixing?** **C. Are the blades rotations set up in a manner that will promote mixing?** **Yes to all three items -** No additional effort is required at this time. ***Follow-up and Recommendations:*** *Design phase* - Include shop drawing requirements for installation details for all dampers as a part of the control system submittal. *Construction phase or Retrocommissioning* - Investigate further if subsequent functional testing indicates problems that can be related to damper configuration issues. **No to any one item -** Improper configuration can lead to a variety of operational problems poor mixing. In turn, these issues can lead to energy waste and nuisance freezestat trips. ***Follow-up and Recommendations:*** *Design phase* - Recommend that the design team include details on the contract documents describing the arrangement of all mixing dampers including blade orientation and rotation, damper arrangements, and blank-off plate locations and requirements or specifically delegate this responsibility to the control contractor via the specifications. Include shop drawing requirements for installation details for all dampers as a part of the control system submittal. *Construction phase* - If the dampers are already installed, then, other than for blade rotation, it is usually best to wait to modify or reconfigure the damper sections based on the results of functional testing. If blade rotation is an issue, recommend that the dampers be reoriented so that the blade rotation promotes mixing. This is easier (less costly) if you can catch the problem before the actuators are installed and piped. Perform functional testing designed to identify damper configuration issues such as the temperature traverse test and the flow linearity test. Modify damper sections or install baffling as necessary to achieve the desired level of performance. *Retrocommissioning* - Reorient the dampers to correct any blade rotation problems. Perform functional testing designed to identify damper configuration issues such as the temperature traverse test and the flow linearity test. Modify damper sections or install baffling as necessary to achieve the desired level of performance.	
	System Turn Down (Variable Flow Systems Only)	

Assess the economizer damper sizing and arrangement

- *How well sized are they?*
- *How well are they arranged to promote mixing?*
- *Are their improvements you would recommend?*
- *Would your recommendations vary with the climate the system was in?*
- *What monitoring and testing would you want to do based on what you observe?*

Damper Characteristic Curves