

# VAV Systems

Design, Performance and Commissioning Issues

A Typical VAV System



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Senior Engineer

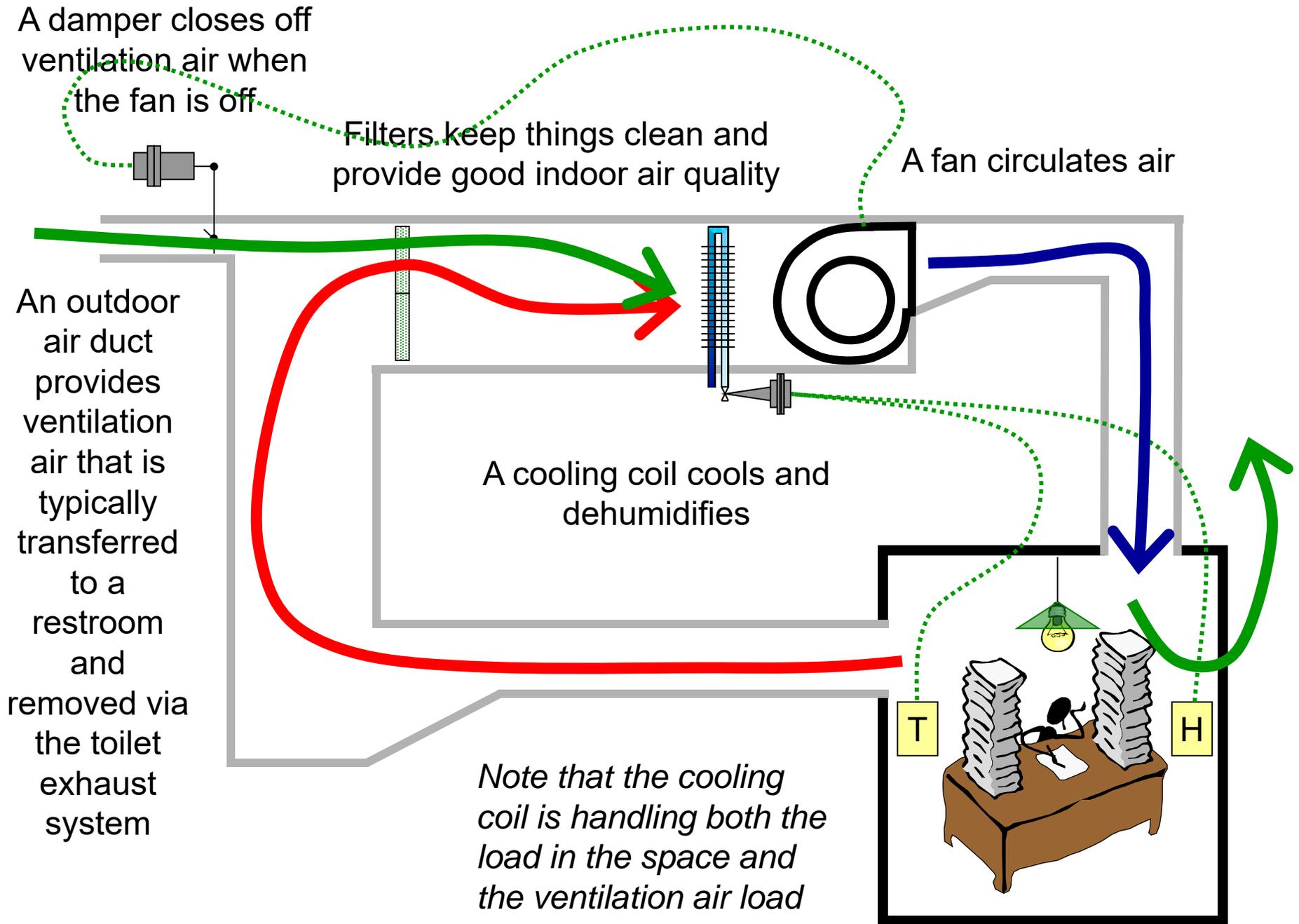
Facility Dynamics Engineering

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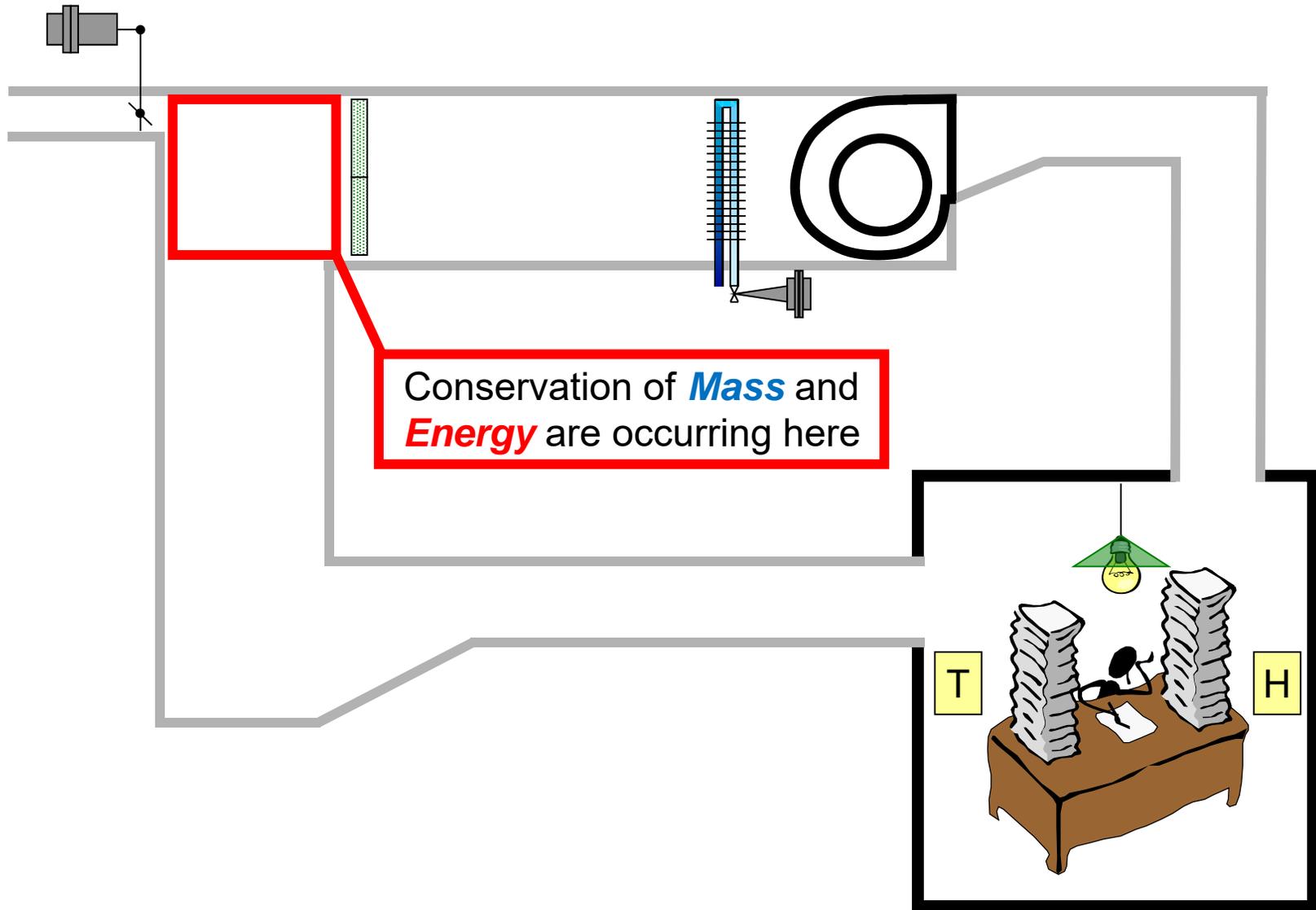


# Putting Together a VAV Air Handling System for Modern Building

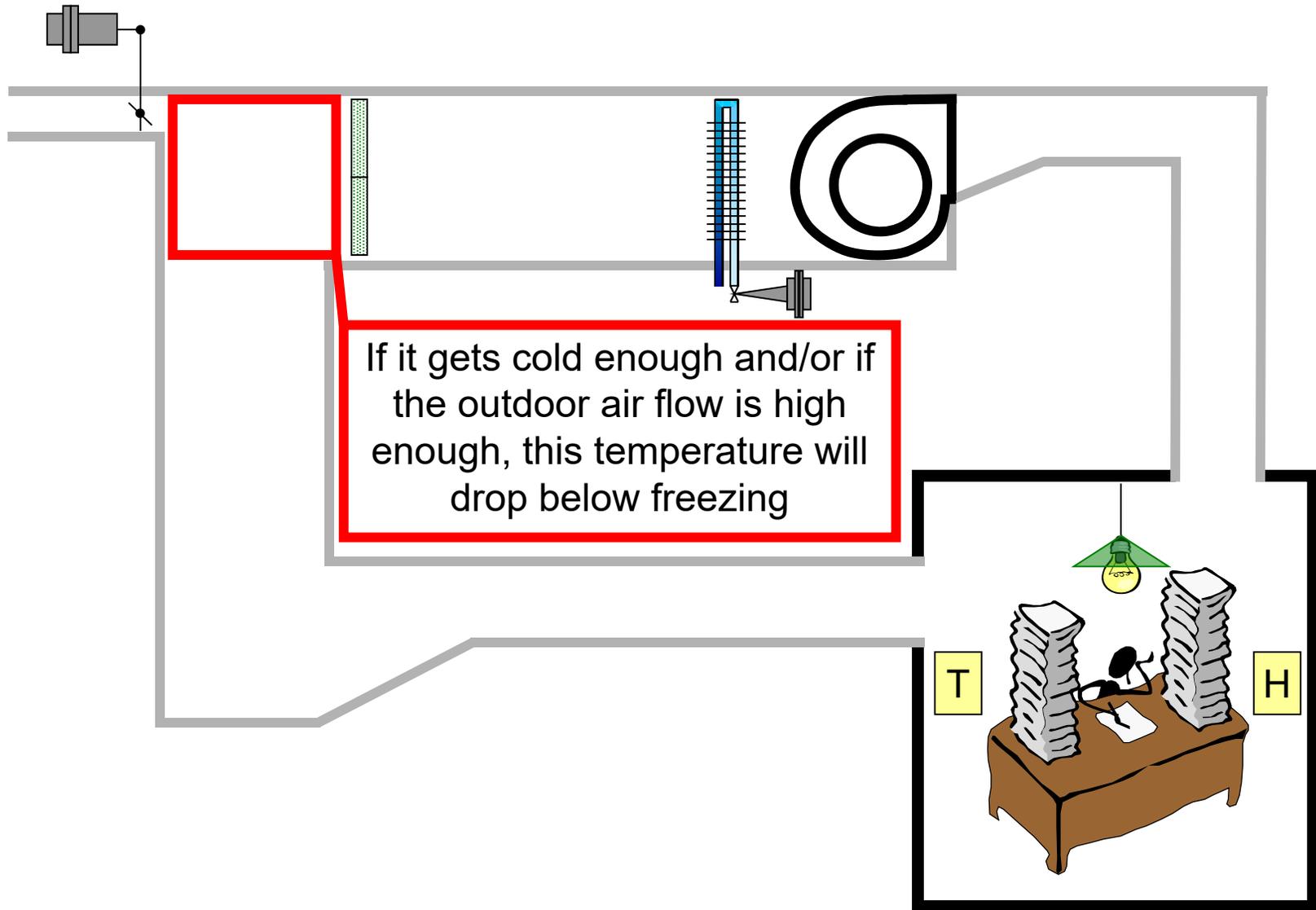
A TYPICAL VAV SYSTEM



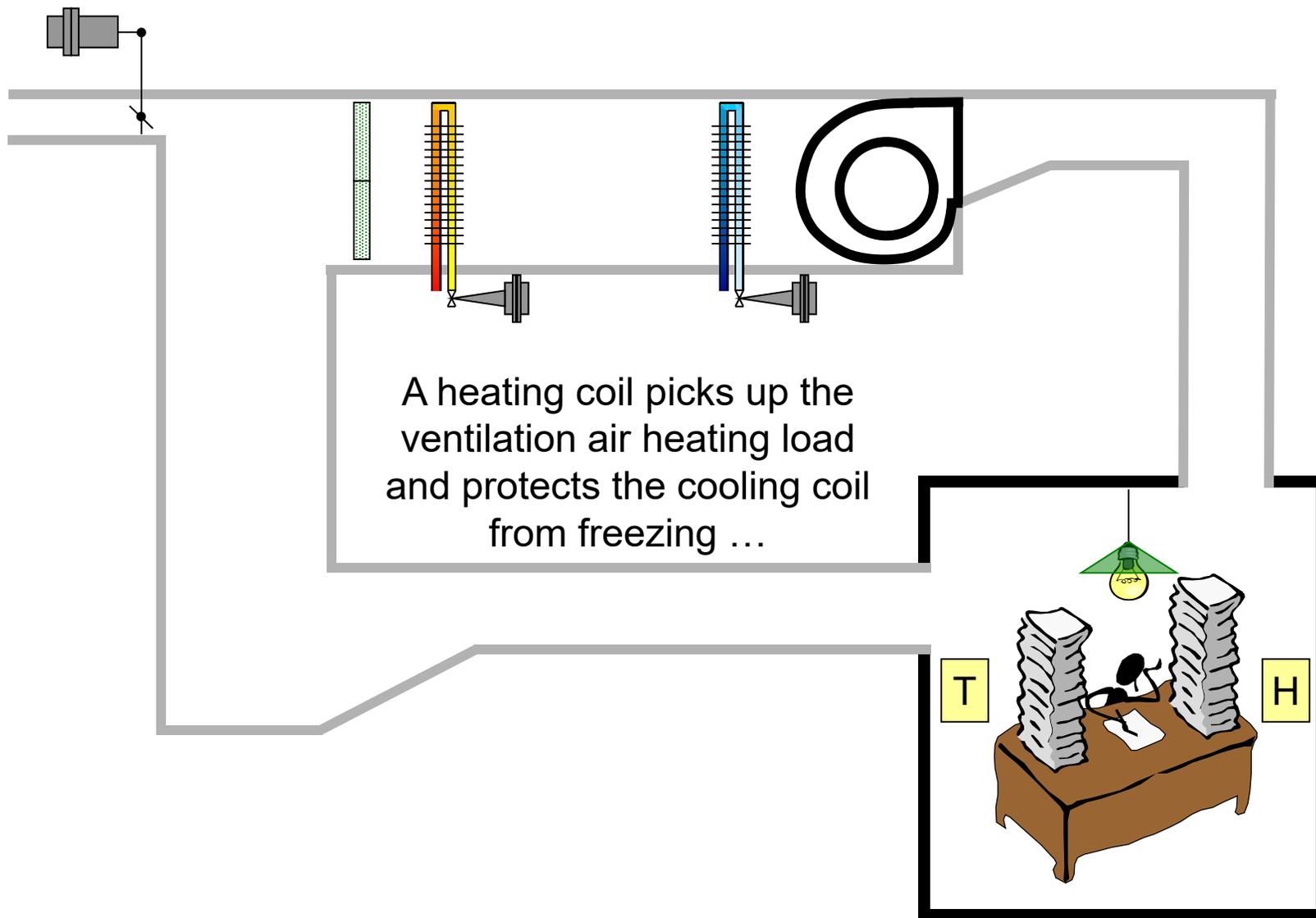
A TYPICAL VAV SYSTEM



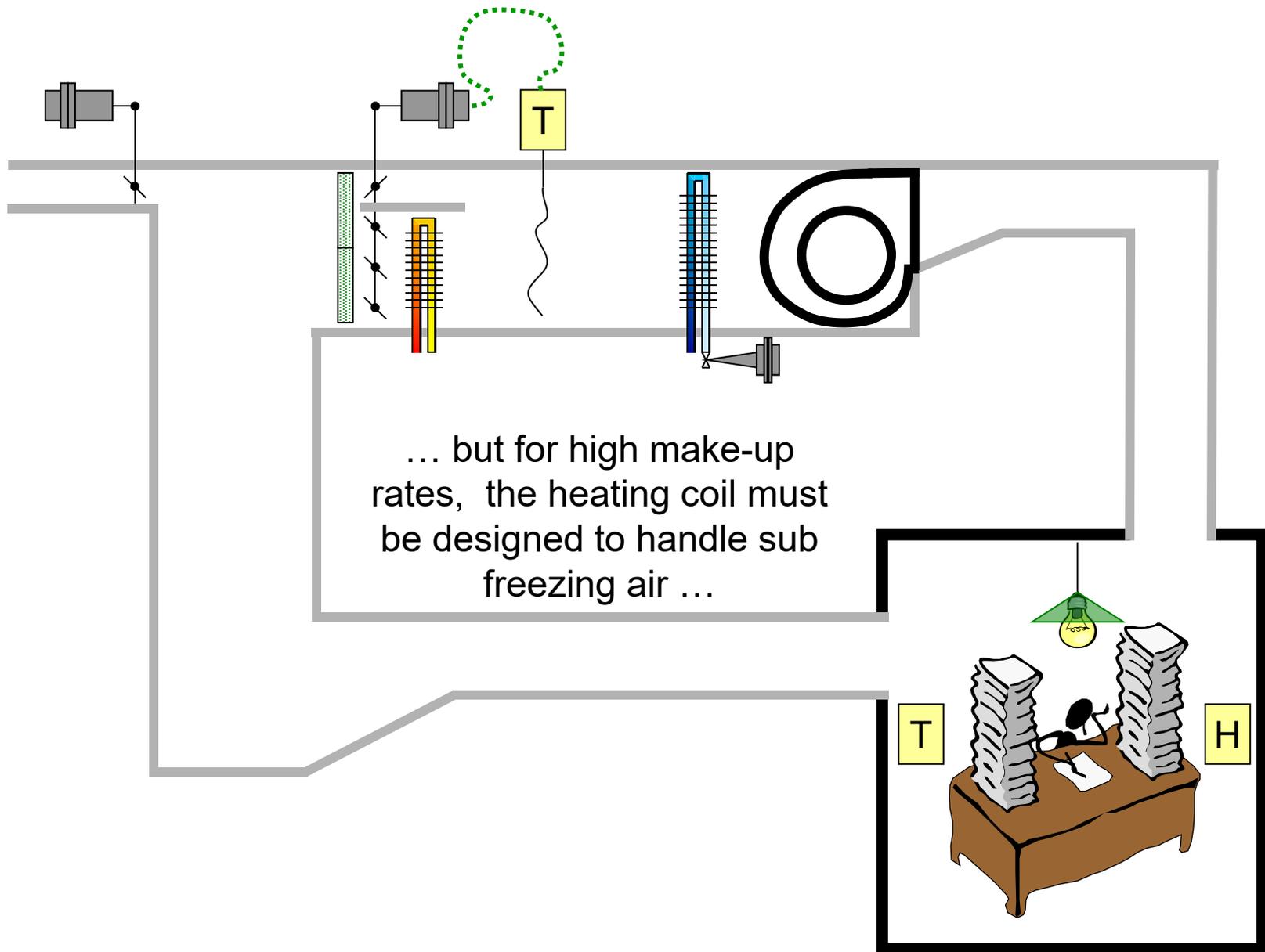
A TYPICAL VAV SYSTEM



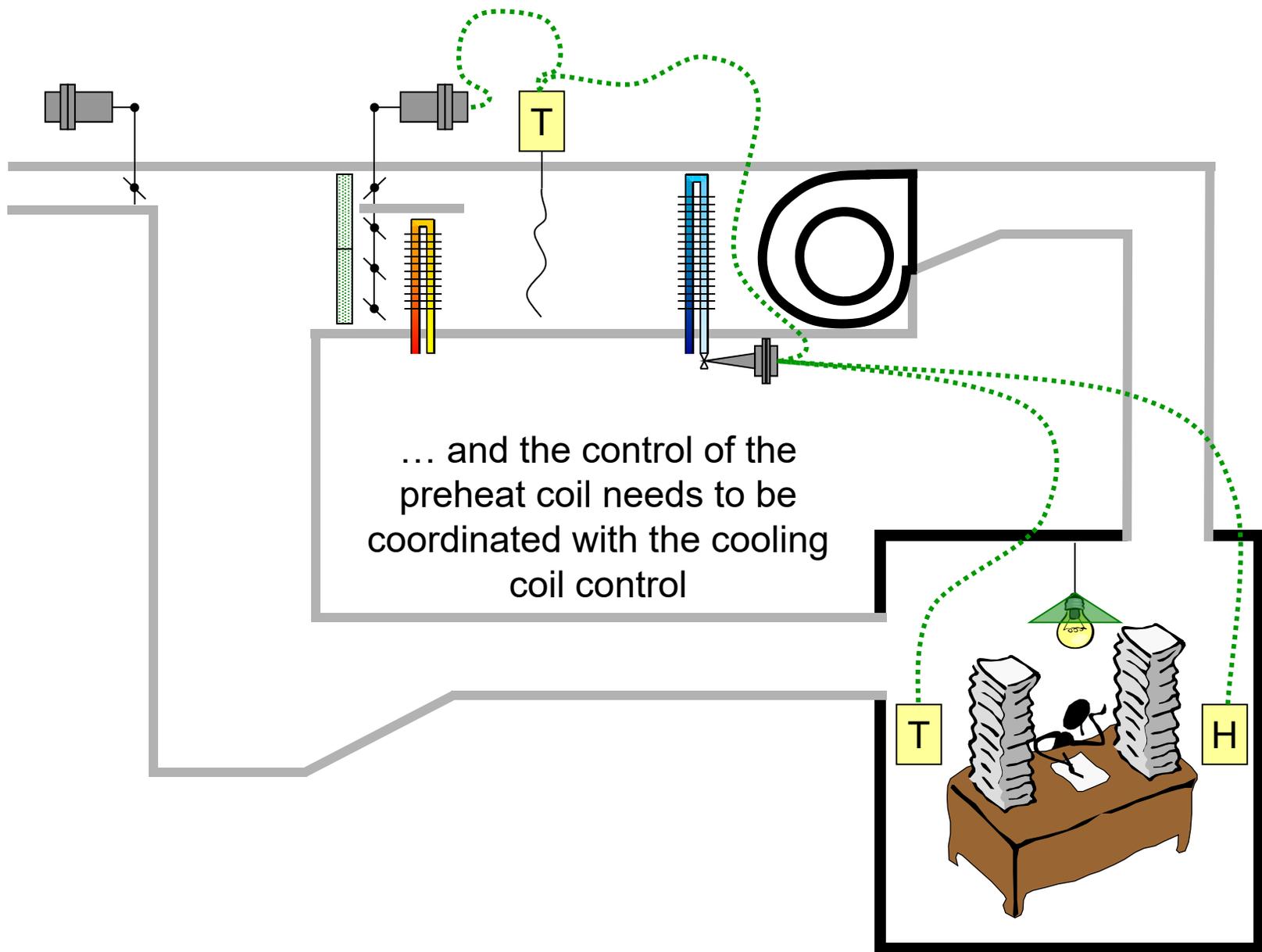
If it gets cold enough and/or if the outdoor air flow is high enough, this temperature will drop below freezing



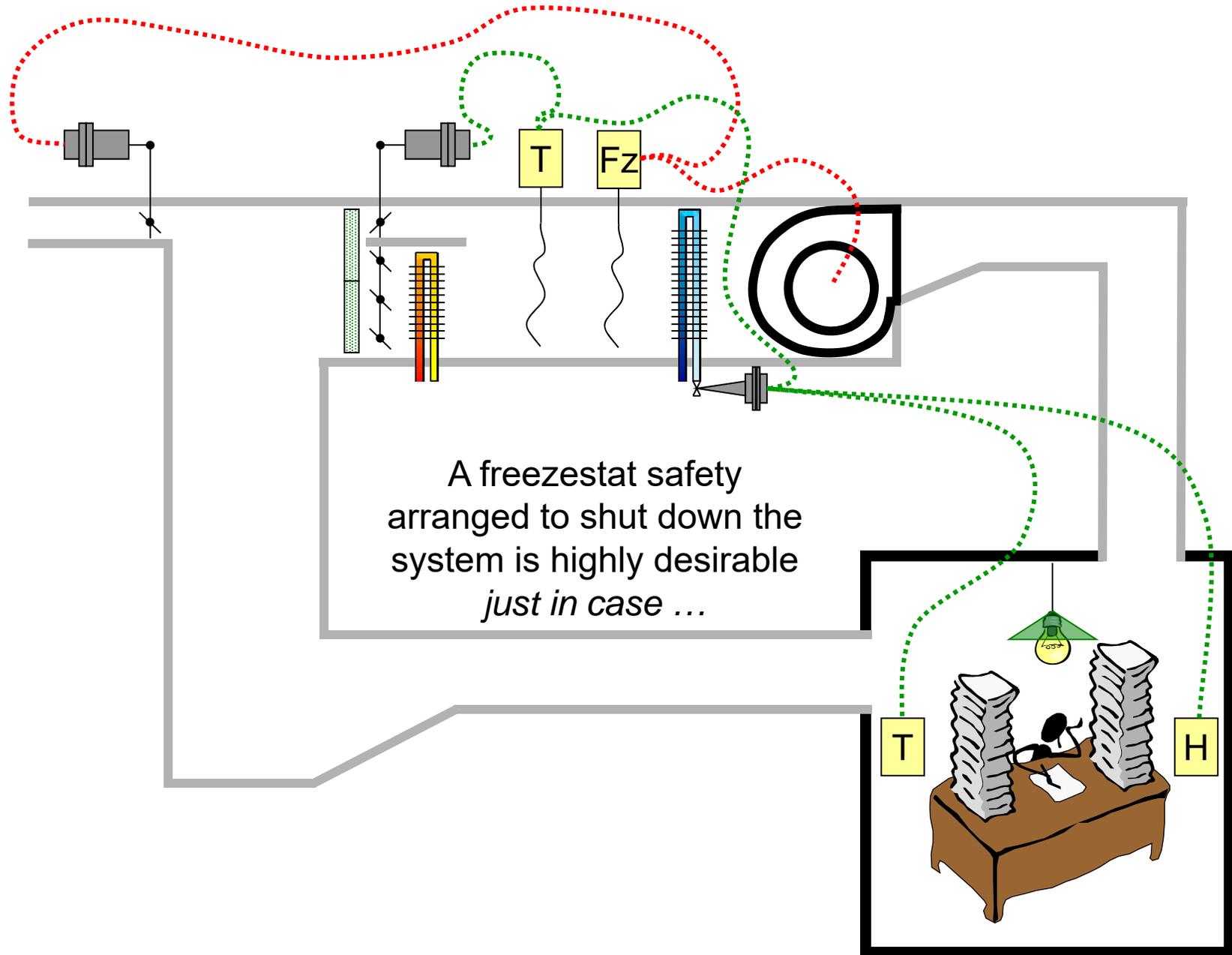
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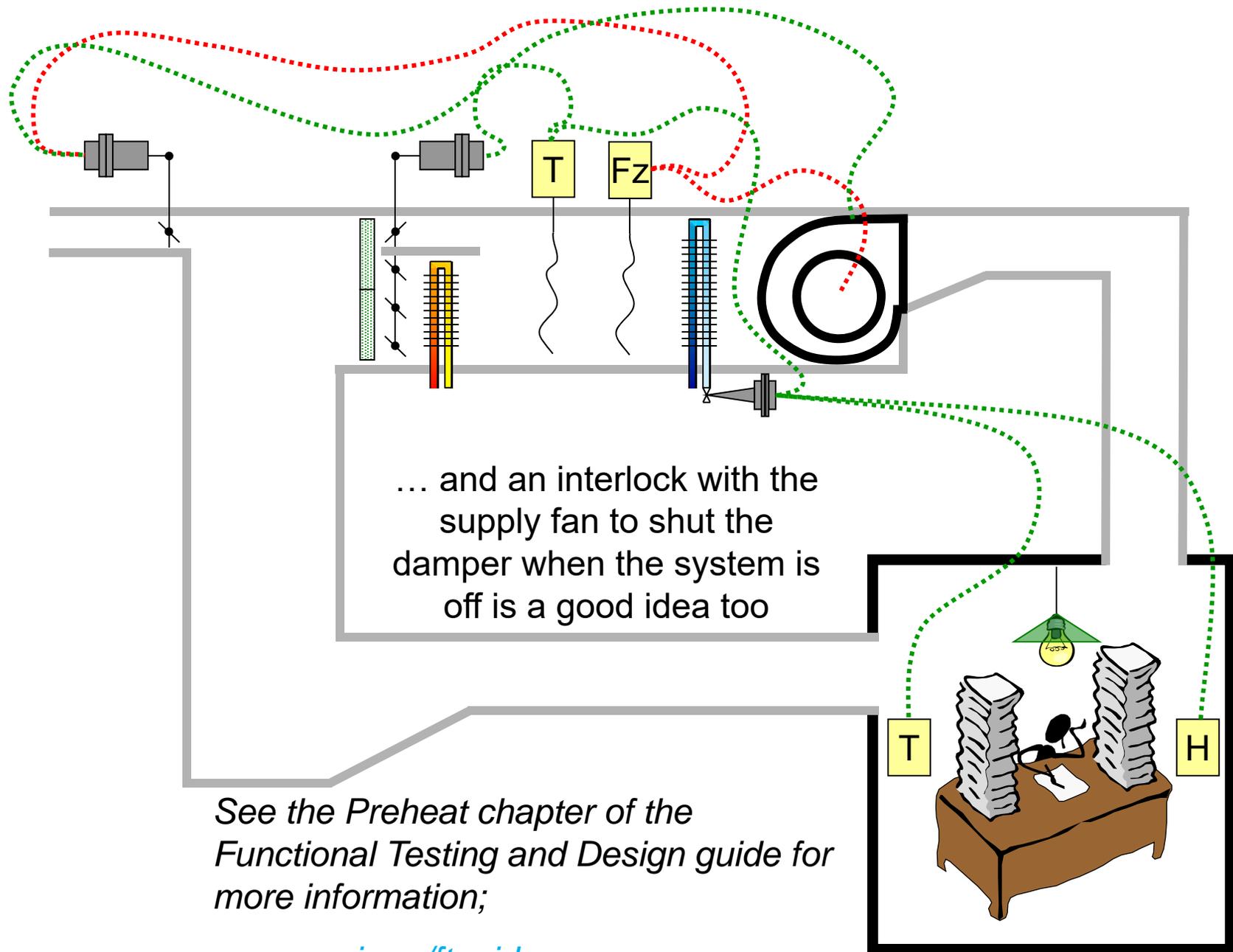
A TYPICAL VAV SYSTEM



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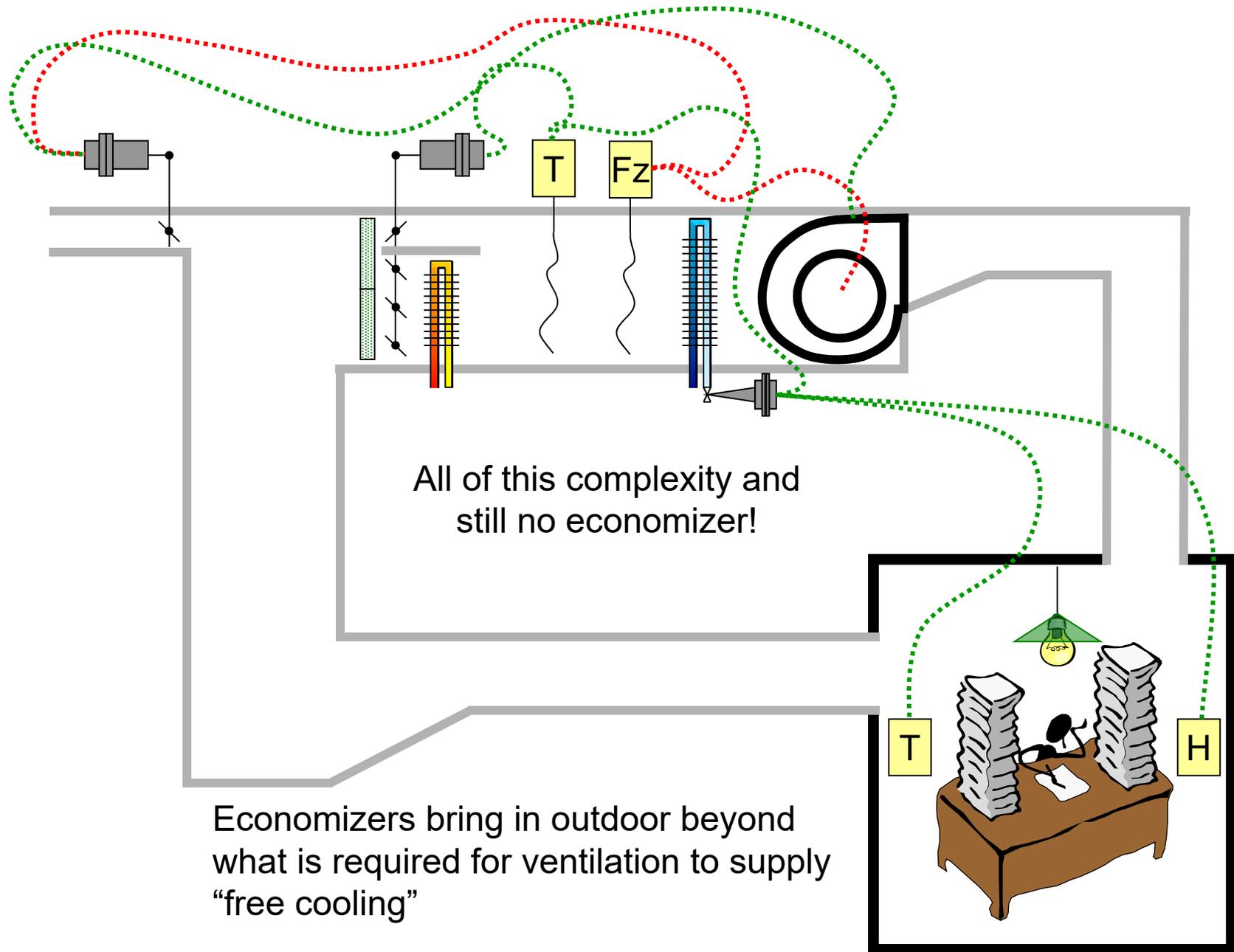


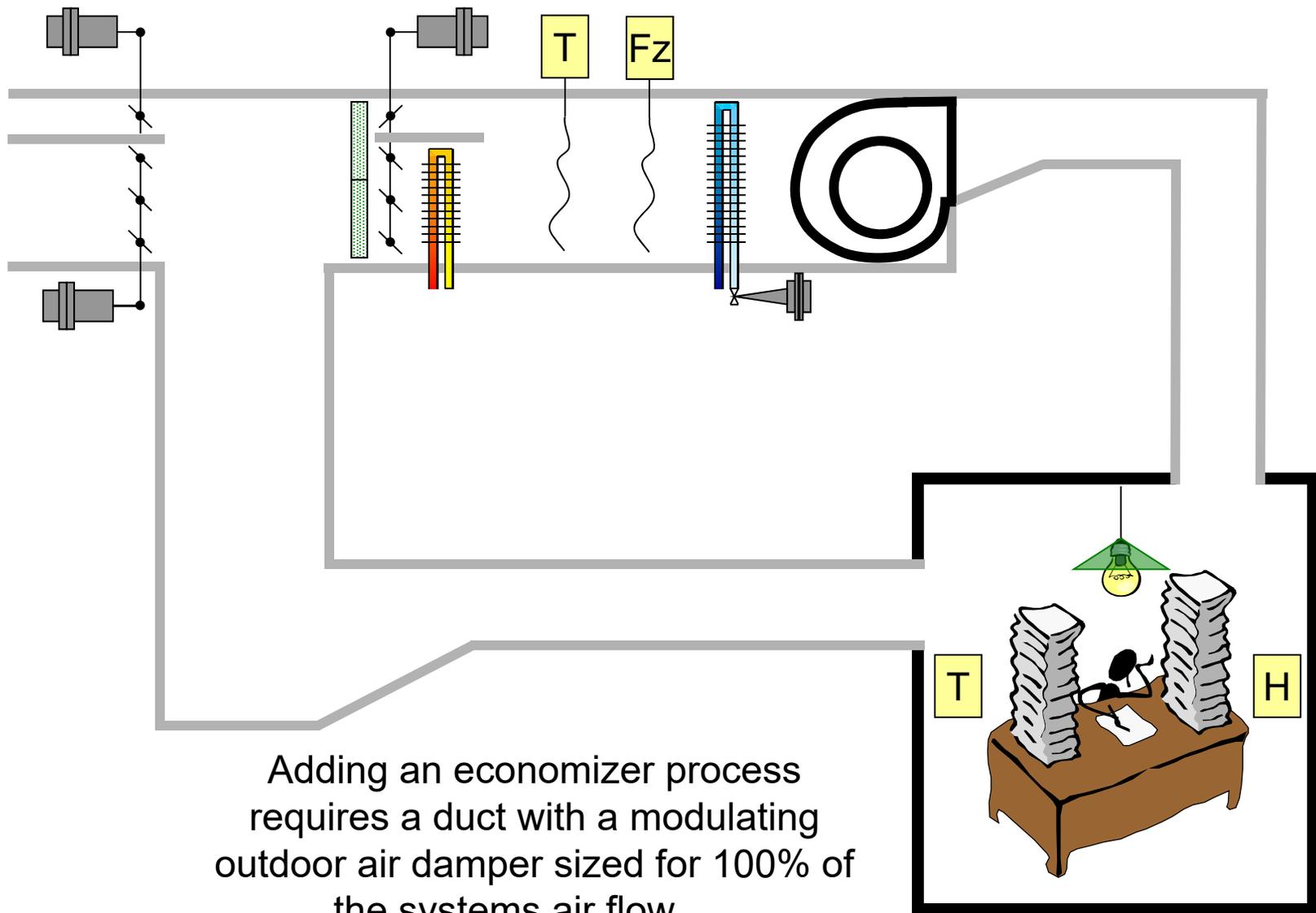
A TYPICAL VAV SYSTEM



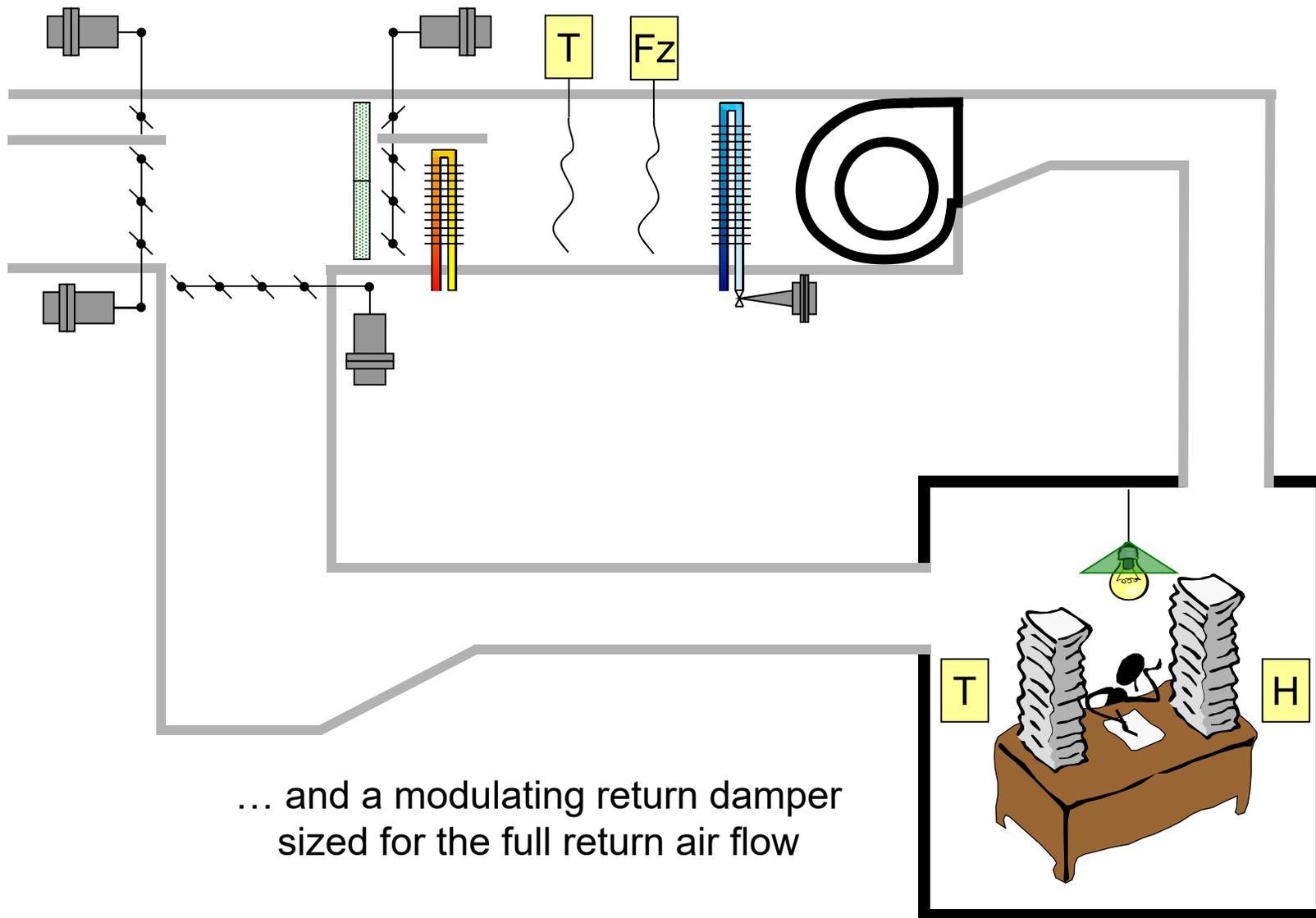
See the Preheat chapter of the *Functional Testing and Design guide* for more information;

[www.peci.org/ftguide](http://www.peci.org/ftguide)

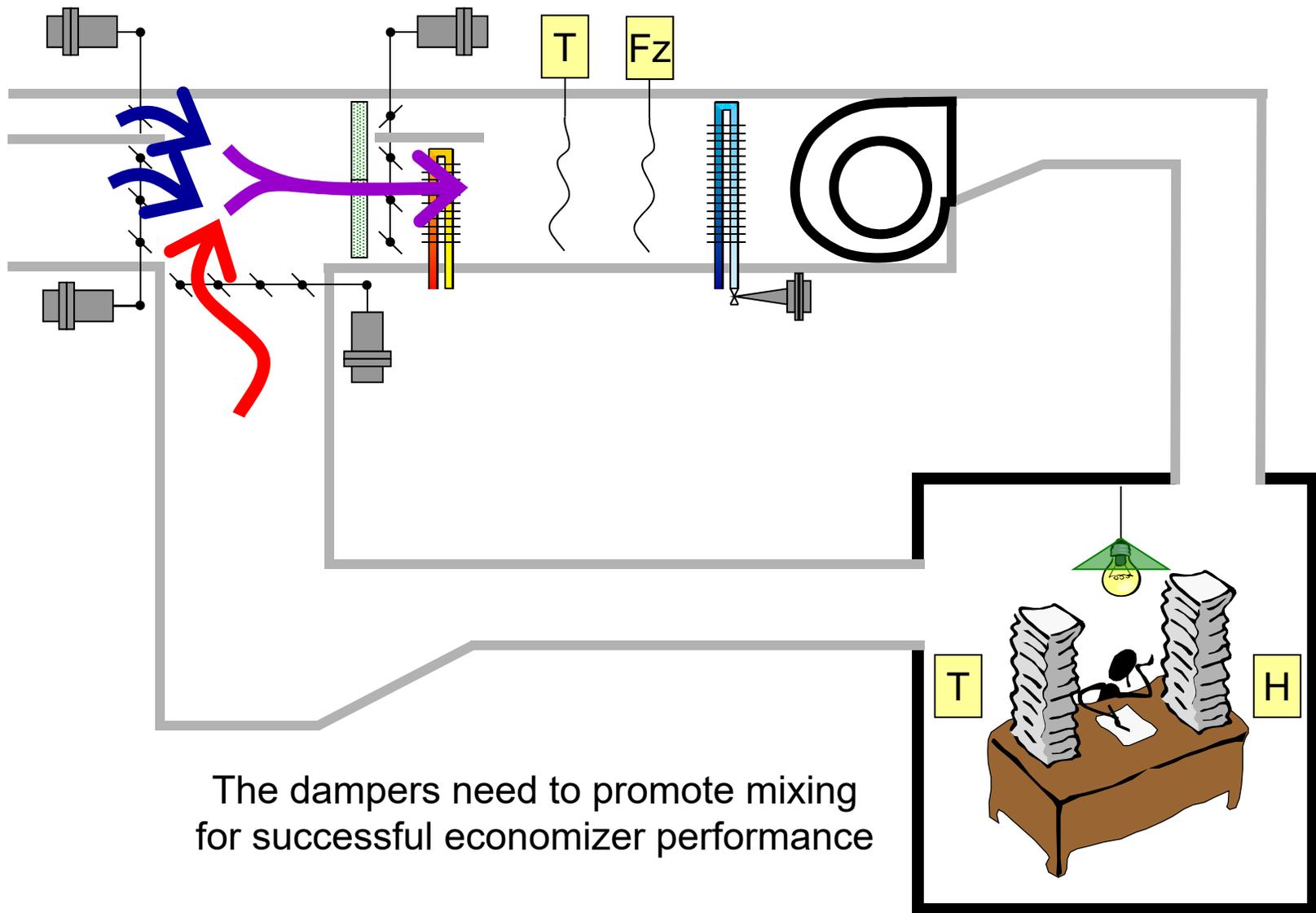




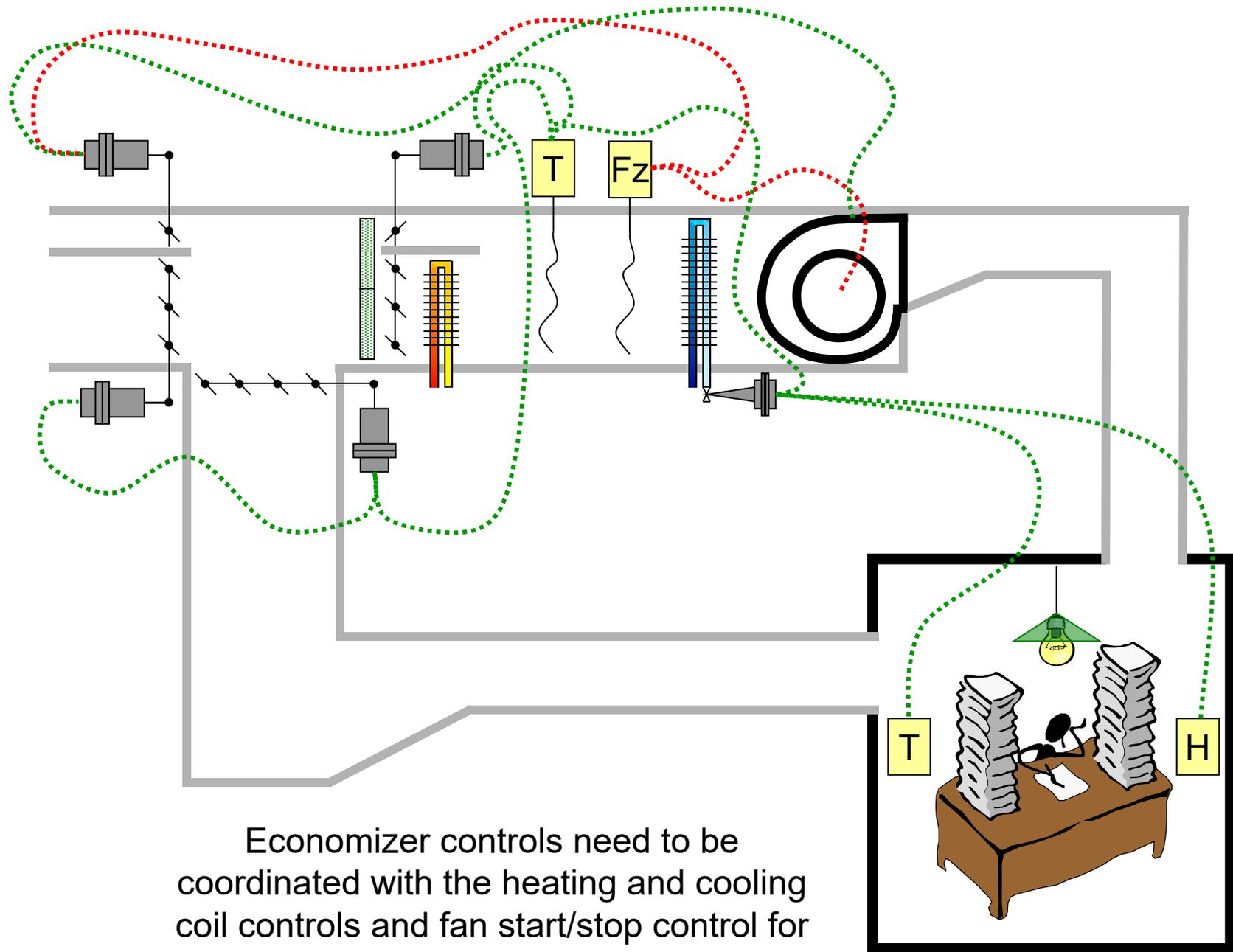
Adding an economizer process requires a duct with a modulating outdoor air damper sized for 100% of the systems air flow ...



... and a modulating return damper sized for the full return air flow

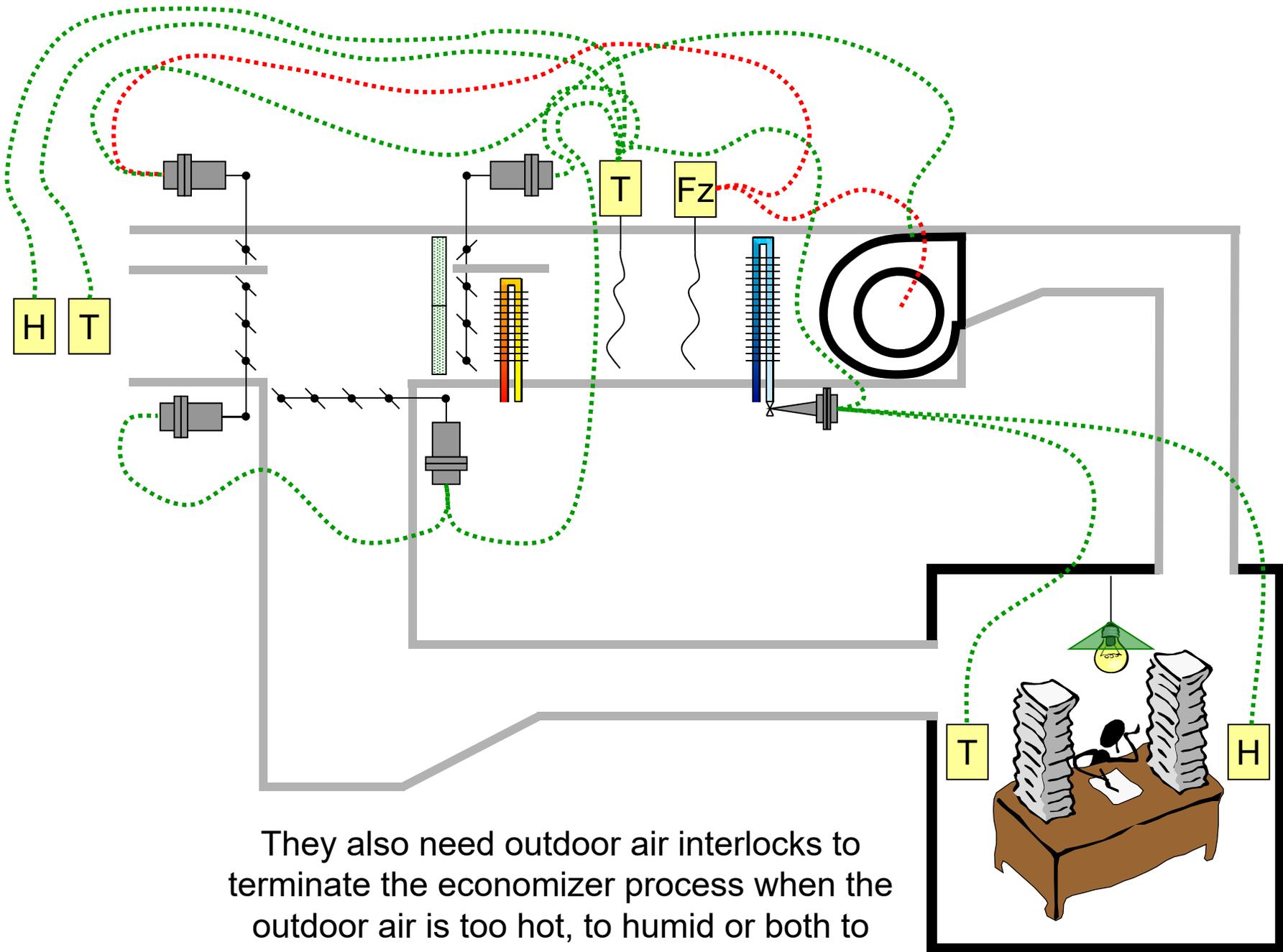


The dampers need to promote mixing for successful economizer performance

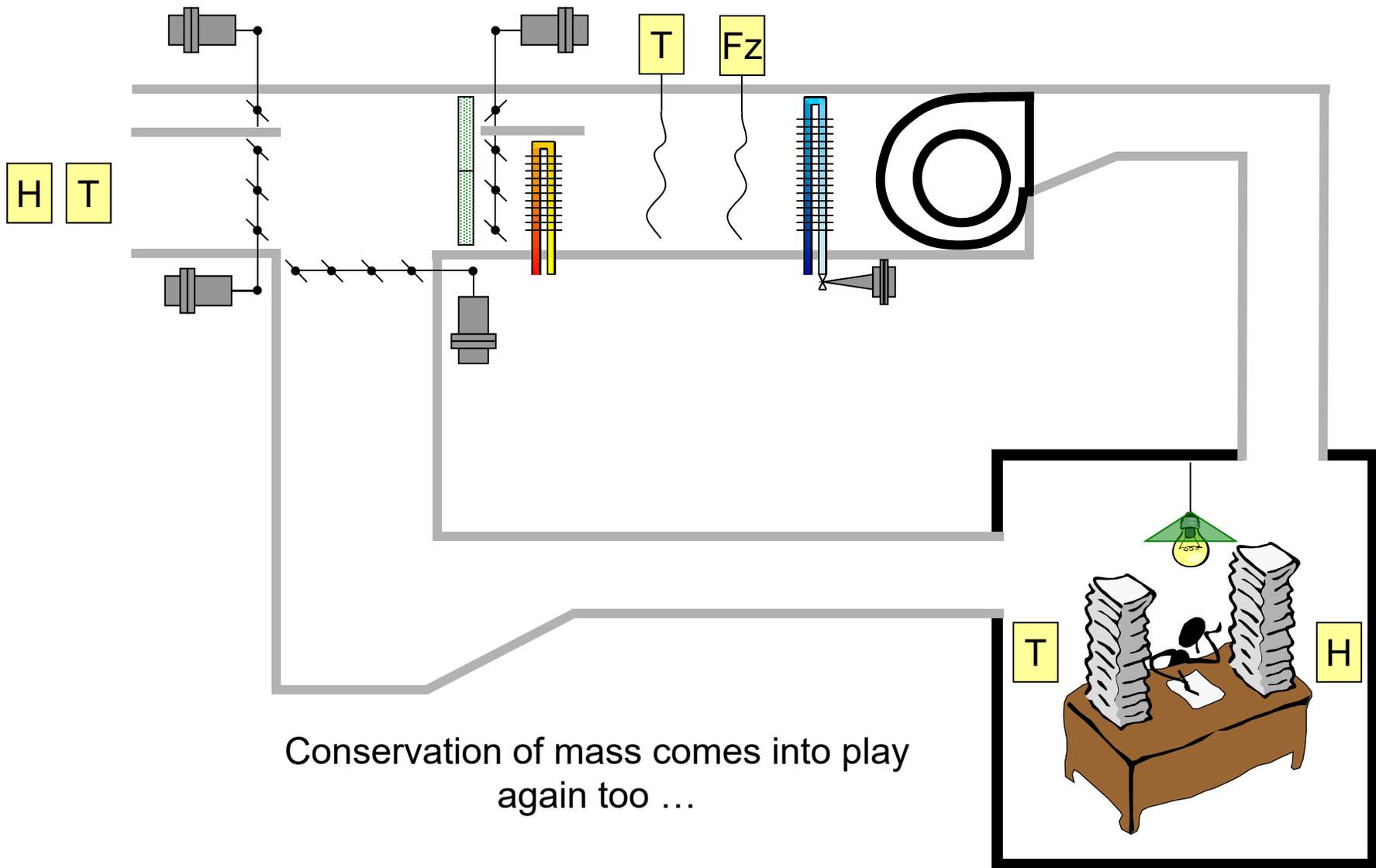


Economizer controls need to be coordinated with the heating and cooling coil controls and fan start/stop control for best efficiency and performance

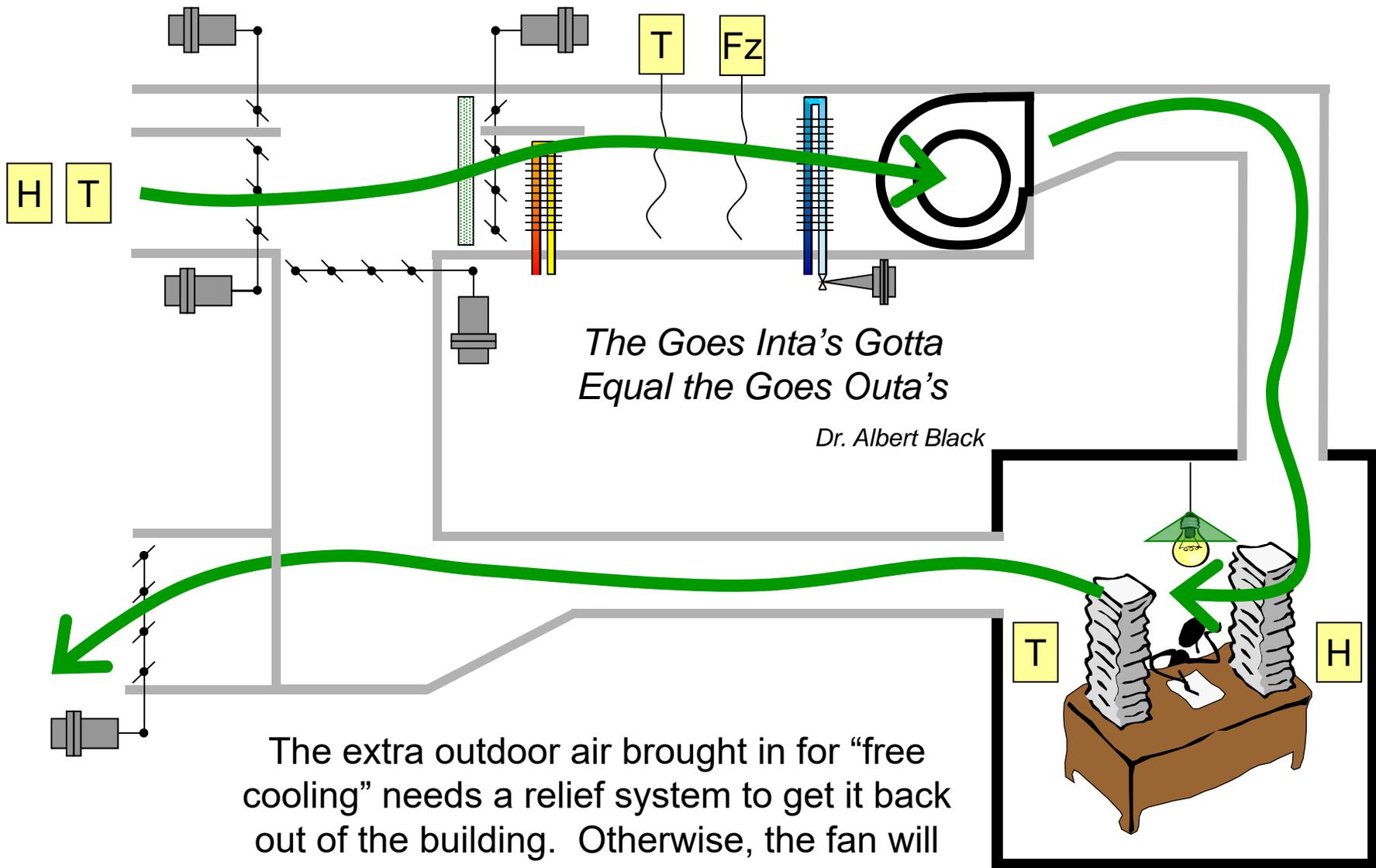
A TYPICAL VAV SYSTEM



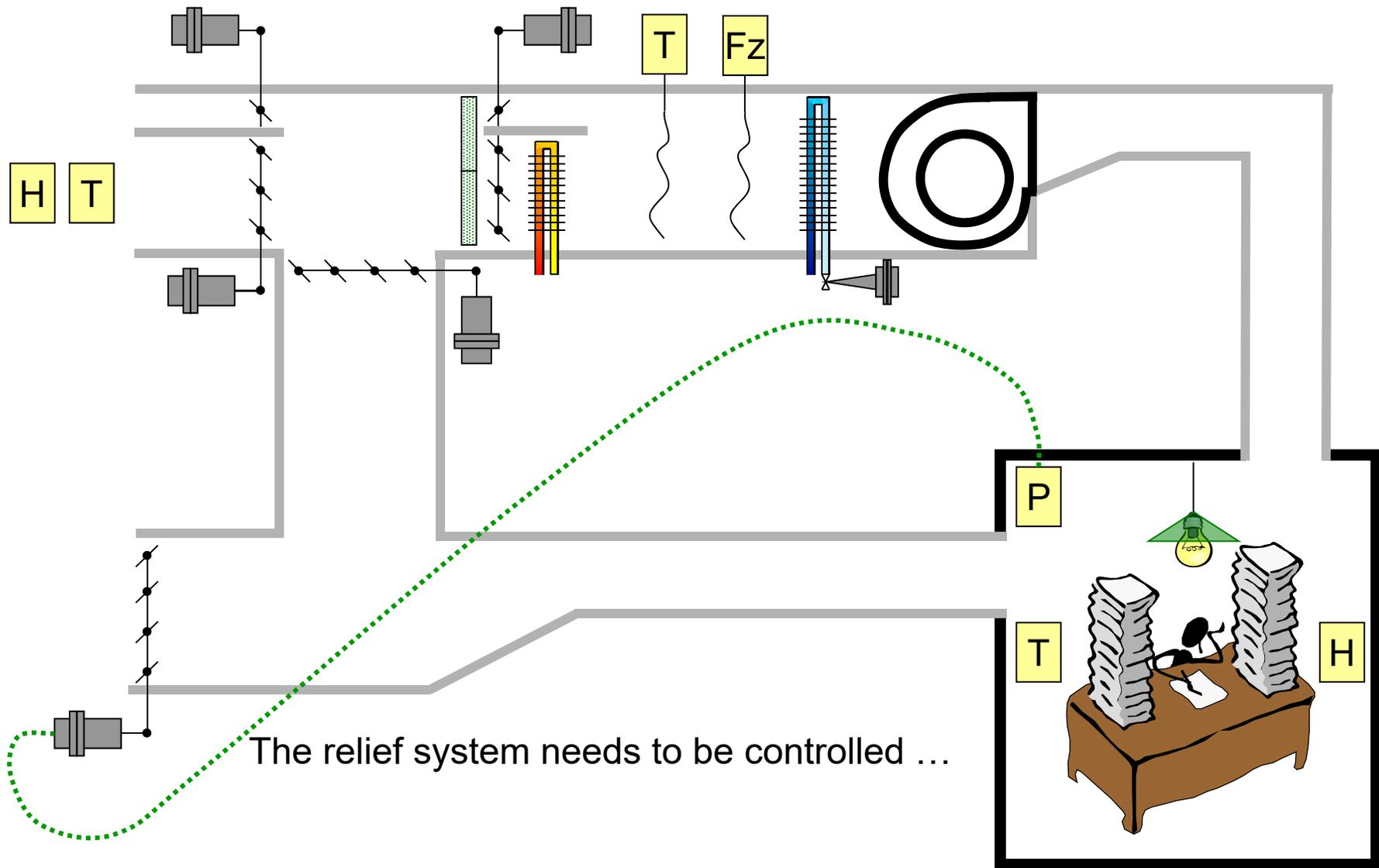
They also need outdoor air interlocks to terminate the economizer process when the outdoor air is too hot, to humid or both to save energy



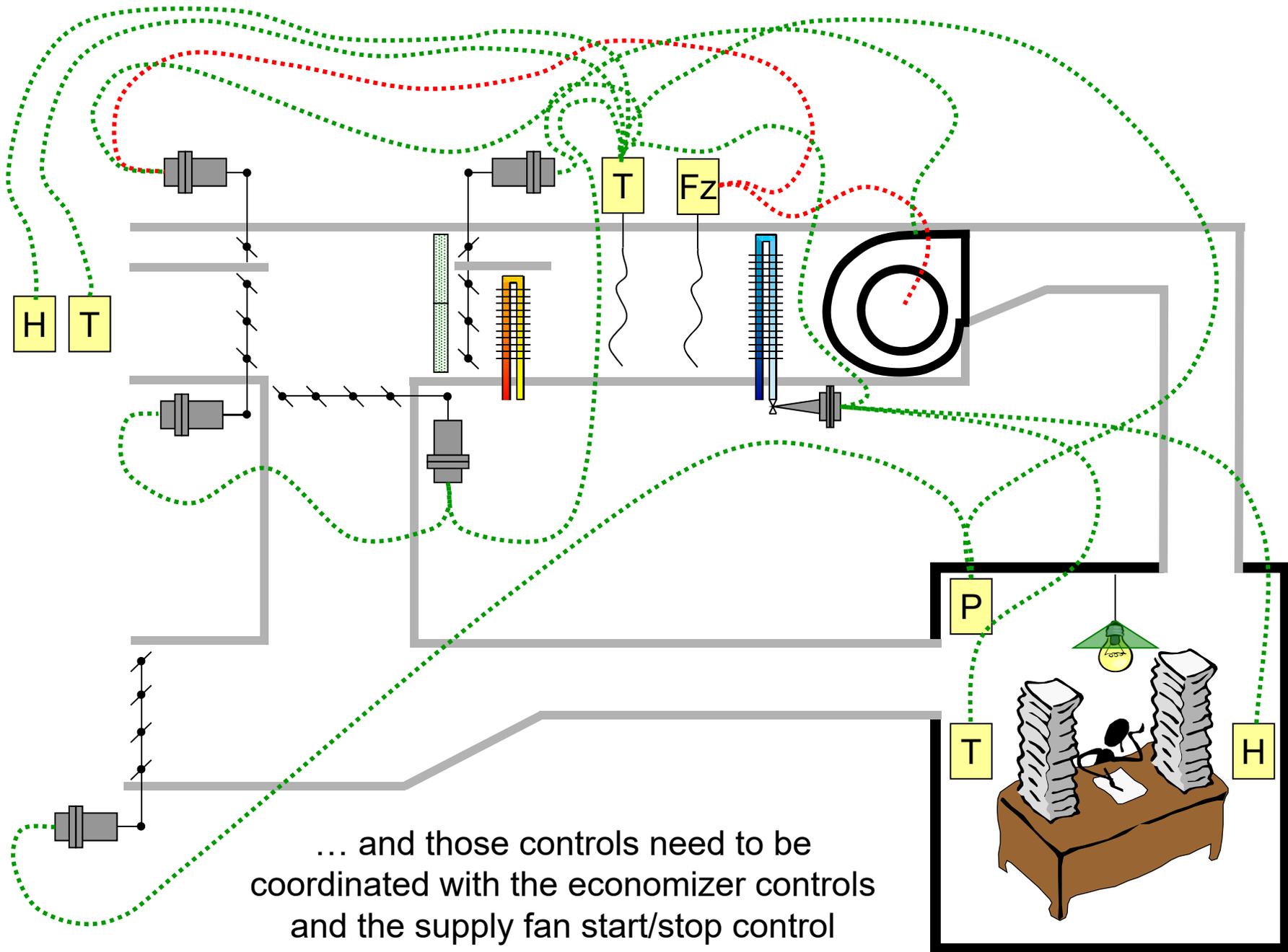
Conservation of mass comes into play again too ...



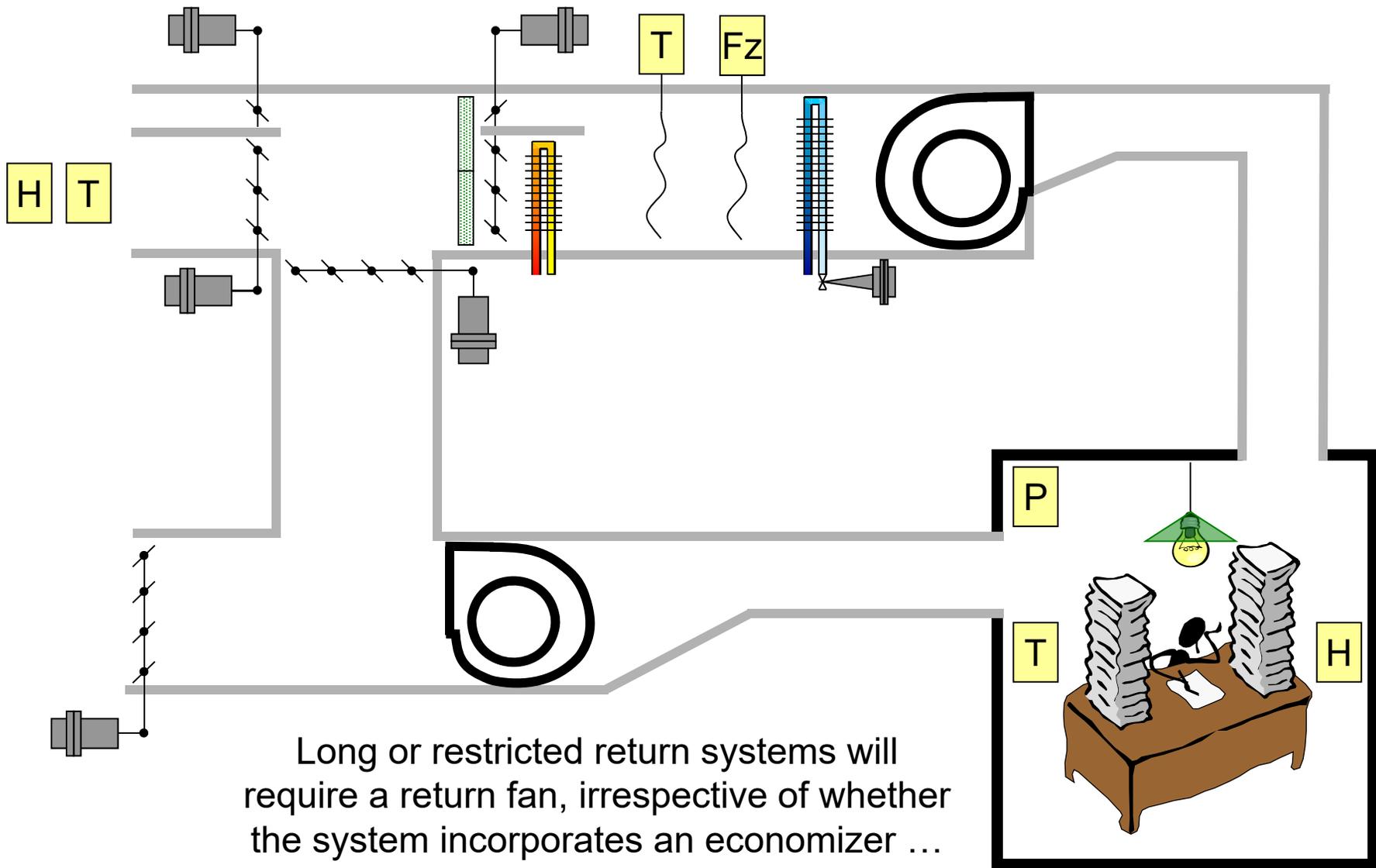
The extra outdoor air brought in for “free cooling” needs a relief system to get it back out of the building. Otherwise, the fan will pressurize the building but move no air



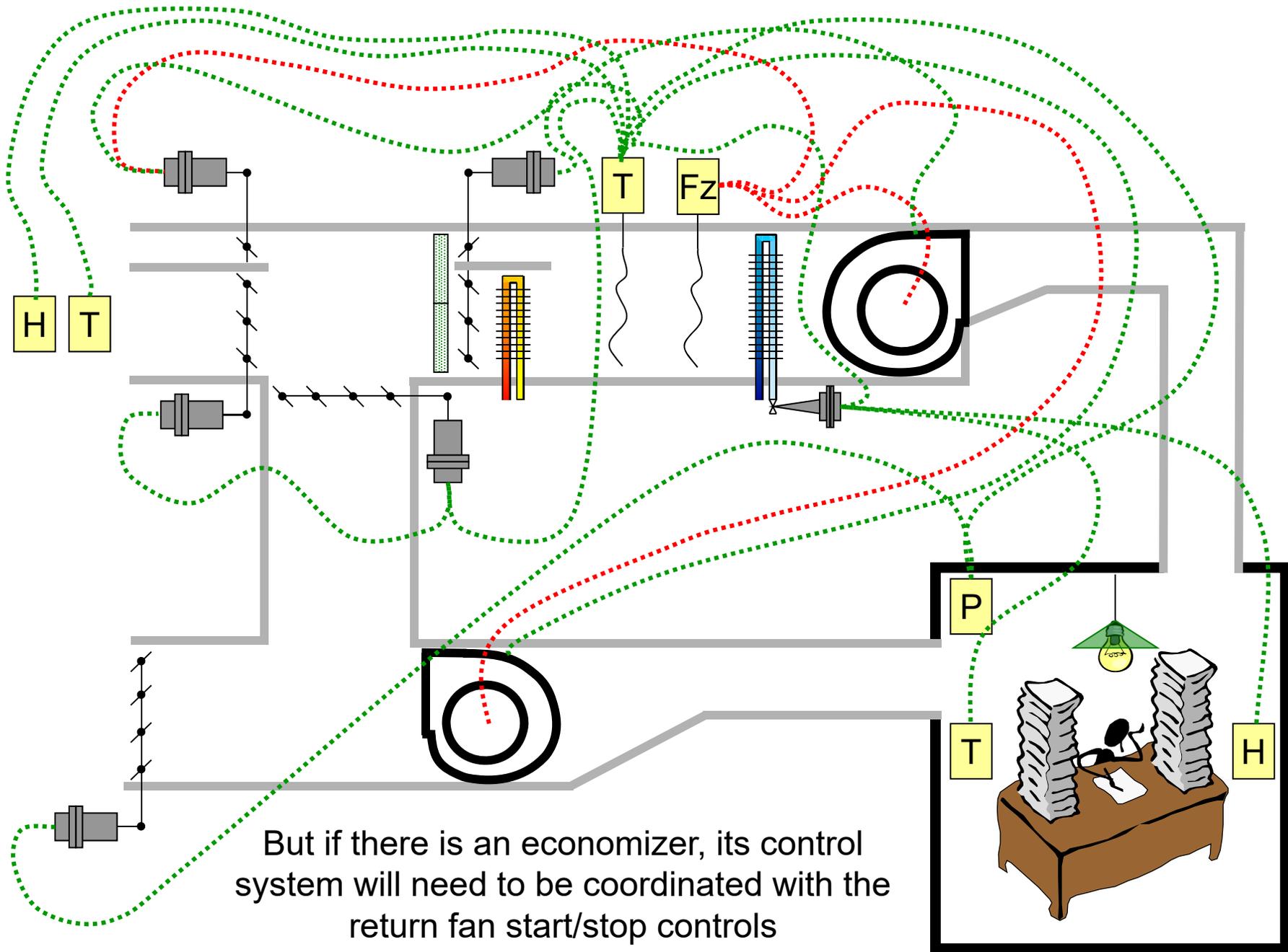
The relief system needs to be controlled ...

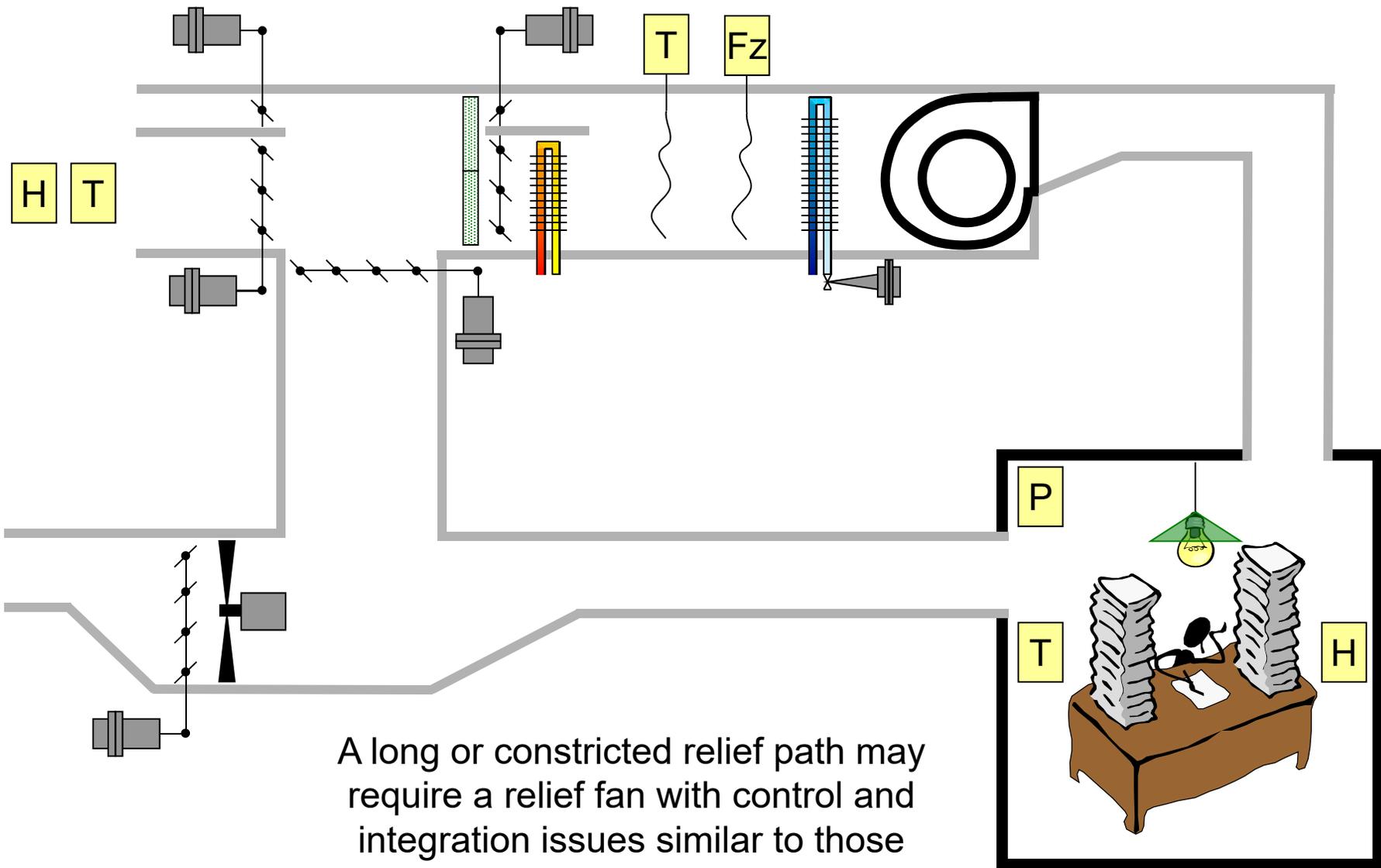


... and those controls need to be coordinated with the economizer controls and the supply fan start/stop control

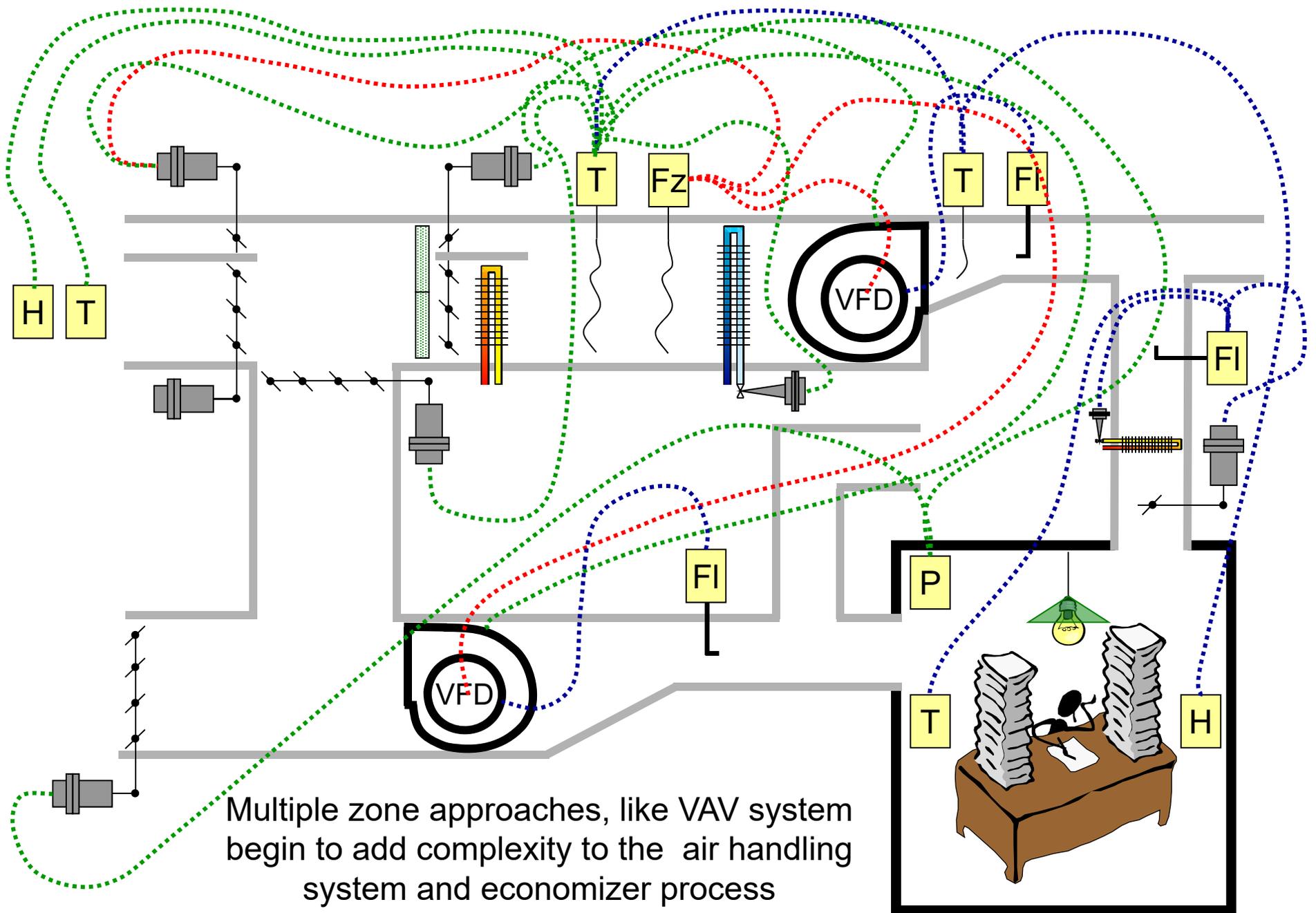


Long or restricted return systems will require a return fan, irrespective of whether the system incorporates an economizer ...





A long or constricted relief path may require a relief fan with control and integration issues similar to those associated with the return fan



Multiple zone approaches, like VAV system begin to add complexity to the air handling system and economizer process

## Bottom Line

Varying flow to keep people comfortable can be a bit of a trick