Stop Trying to Use your Old Stuff... CEMS Issues and what Engineering is Doing about them

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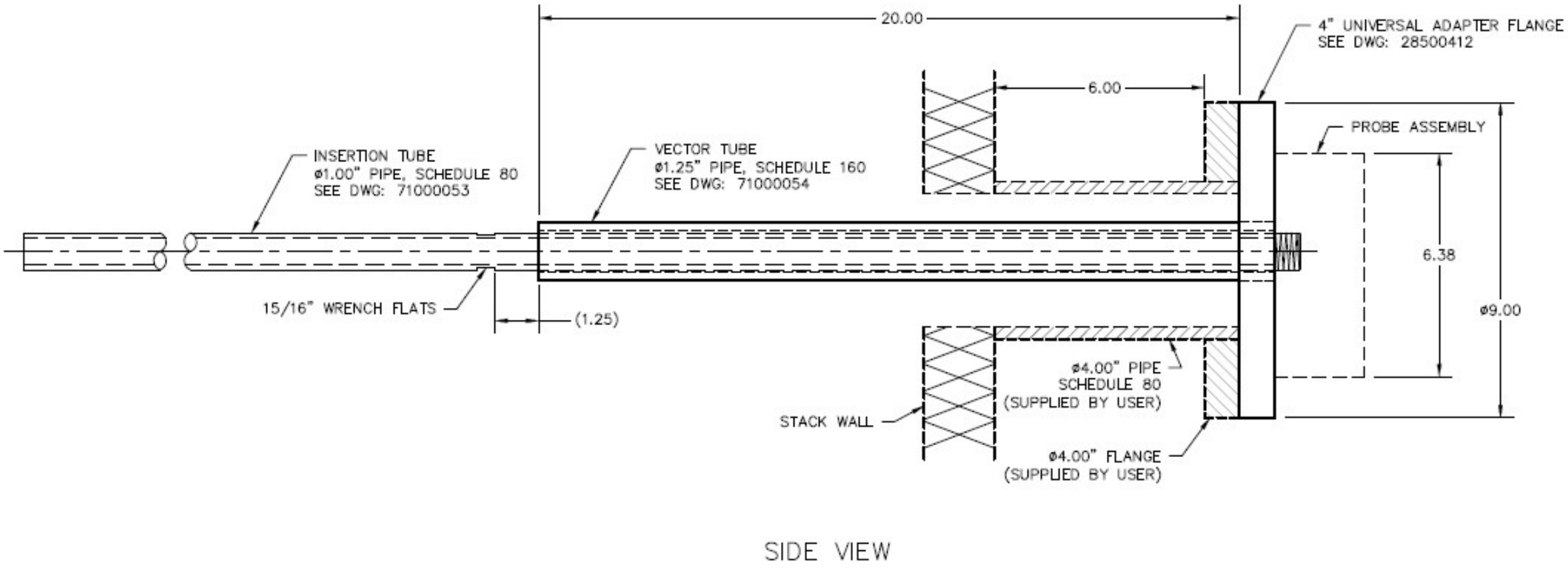
Insertion Tubes Break Off

- Not very frequently, but bothersome, Insertion Tubes might break off in the stack or SCR duct.
- Occurs in high velocity and high temperature applications, such as SCR ducts or Peaker units
- Insertion tube breaks off at the threads due to the cantilever design.
- All new CiSCO probes use a reinforcement pipe to decrease the lever arm and move the stress point away from the threads

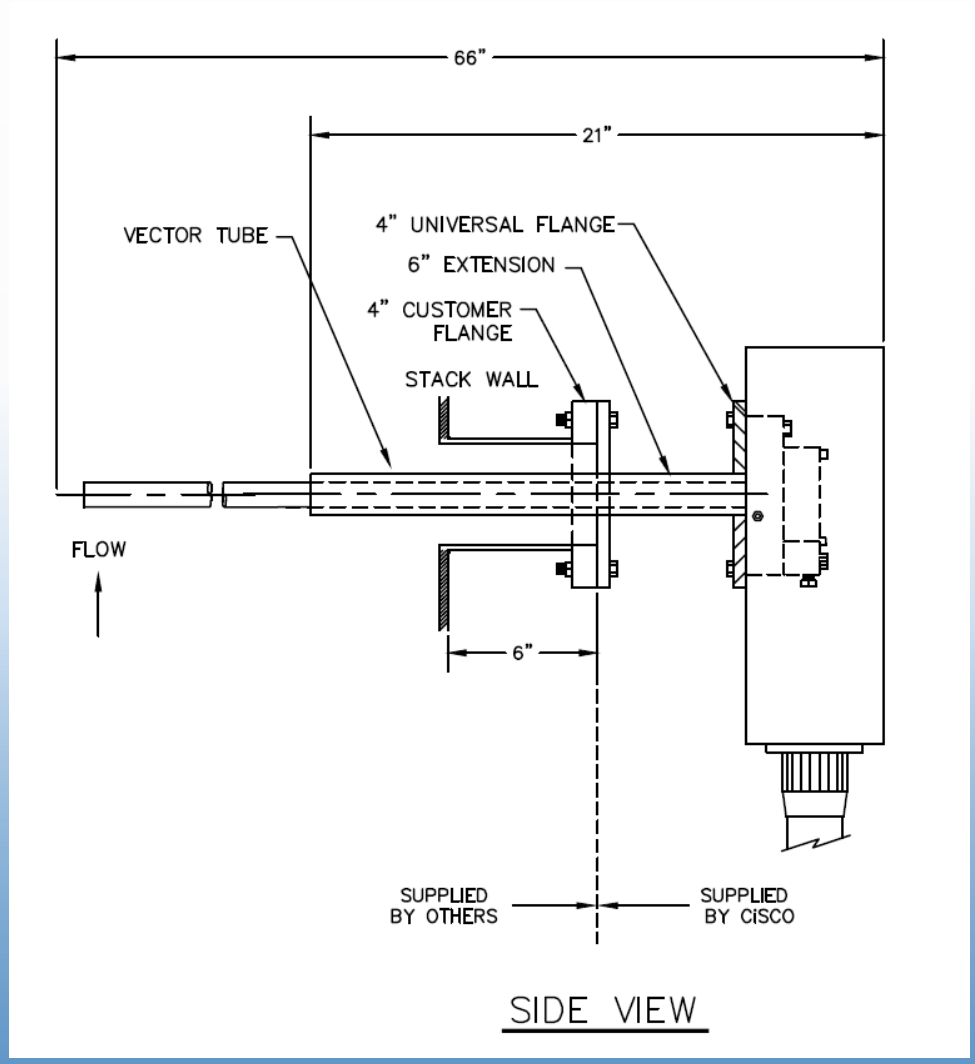
Reinforced Insertion Tube (Vector Tube)



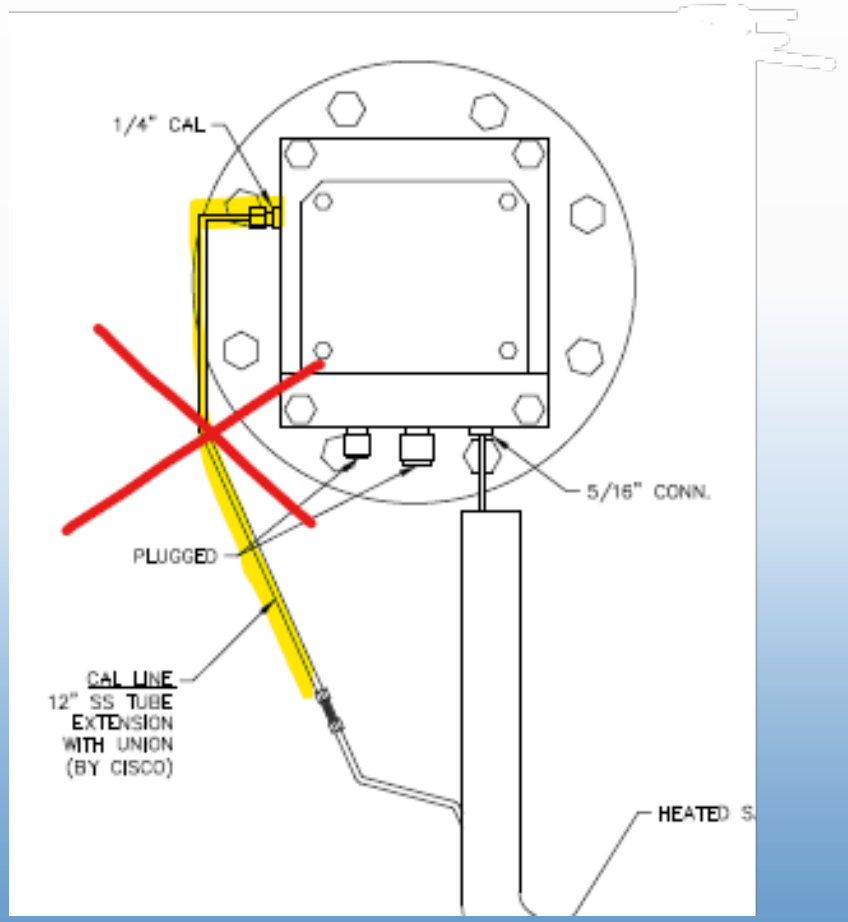
Probe Freezing or Condensing Moisture

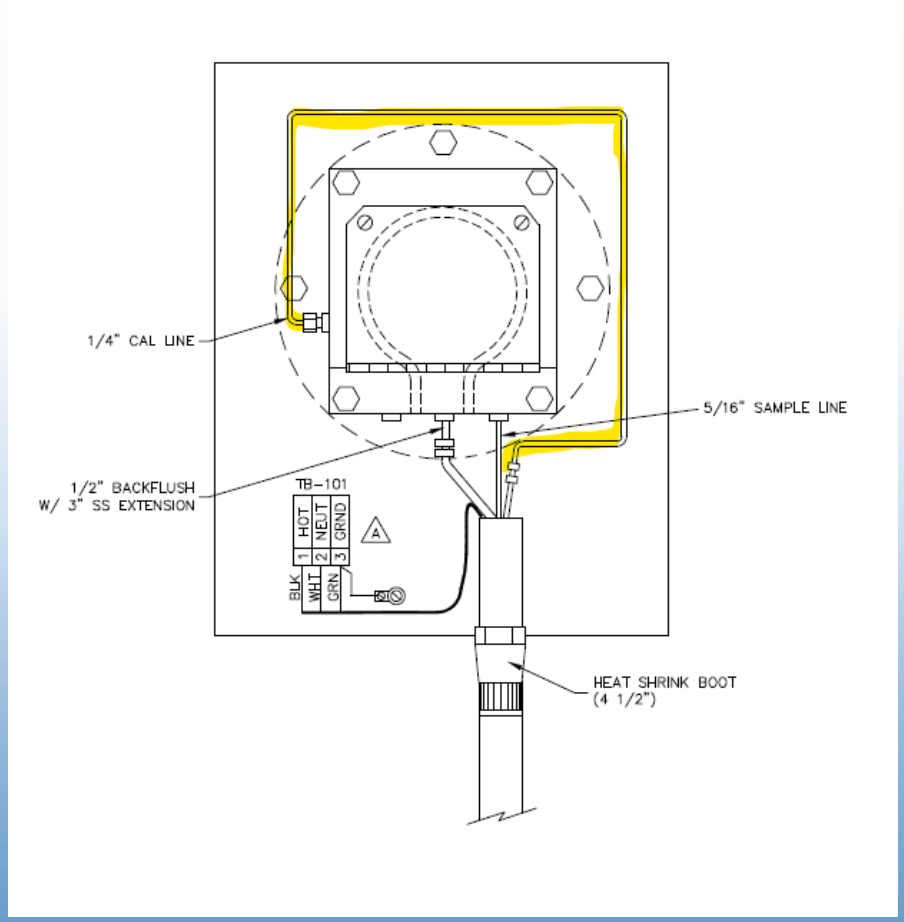
- Occurs with High Temp Design Probes which do not include heaters.
- During normal operation, the process provides sufficient heat to prevent condensation, but during process shutdowns, residual moisture might condense and even cause freezing.
- Solutions include adding a cartridge heater into the unused backflush port on the probe manifold. This would be a retrofit and required adding high voltage power source to the probe and junction box.
- CiSCO now using heated probes for high temperature environments and adding a probe extension to heater failure from excessive temperatures.

Heated Probe in High Temp Environment



Routing Cal. Extension Upward so Moisture does not Drip into the Cal Tube





Sample Lines: Over-Temperature Shutdown

- Over-temperature shutdown is a fail-safe shutdown circuit which provides backup in case a temperature controller or power relay fails.
- Power relays in particular have been known to fail in a closed position, causing runaway sample line temperatures, potential catastrophic.
- Implemented due the importance of a functional sample line, and the lead times and cost of purchase and installation.
- A secondary temperature control device, or the PLC will monitor the sample line temperature and cut off power if an excessive temperature (375-400F) situation is detected.
- User can reset the control device or use the OIT to reset and resume normal operation when deemed safe.

Sample Pump Relays

- CiSCO has used a Magnecraft solid state relay for years to turn the sample pump off when a water alarm is detected.
- We have had random failures of the solid state relays likely due to control power short circuits or power surge.
- Now using a mechanical relay that mounts external to the sample pump power junction box.

Tap image to zoom

In the Works Design Changes

- Use controlled solenoid valves for Probe versus Cabinet calibration position
  - CISCO has always used a manual switching valve until now.
  - Problem occurs when someone leaves the valve in the wrong (cabinet) position.
  - Controlling the valves from the PLC allows additional functionality such as:
    - An automated vacuum leak test.
    - Alarming if the valve is left in the cabinet position for too long.

Flow Switches for Sample or Calibration

- Older Flow Switches were unreliable, including the Malema and AutoFlow
- Now using ChemTec Switches, which are very reliable, simple and inexpensive.
- Calibration gas flow switches have been replaced by cylinder pressure switches
- When the Cal Flow Switch Indicates a Failure, it is too late.

Air Dryers

- CiSCO used the Pure Gas dual tower regenerative instrument air dryer for years.
- We have switched to the Parker membrane dryer for the air supply.
  - Parker dryer does not require power, and so is easier to install.
  - Has smaller footprint to fit in tighter spaces.
  - Easy to replace and is the same cost as the Pure Gas dryer.
  - Eliminates the loud once-a-minute click and pressure relief noise in the shelter.
  - Coalescing and particulate filters included.

Air Dryers

PureGas Desiccant Tower

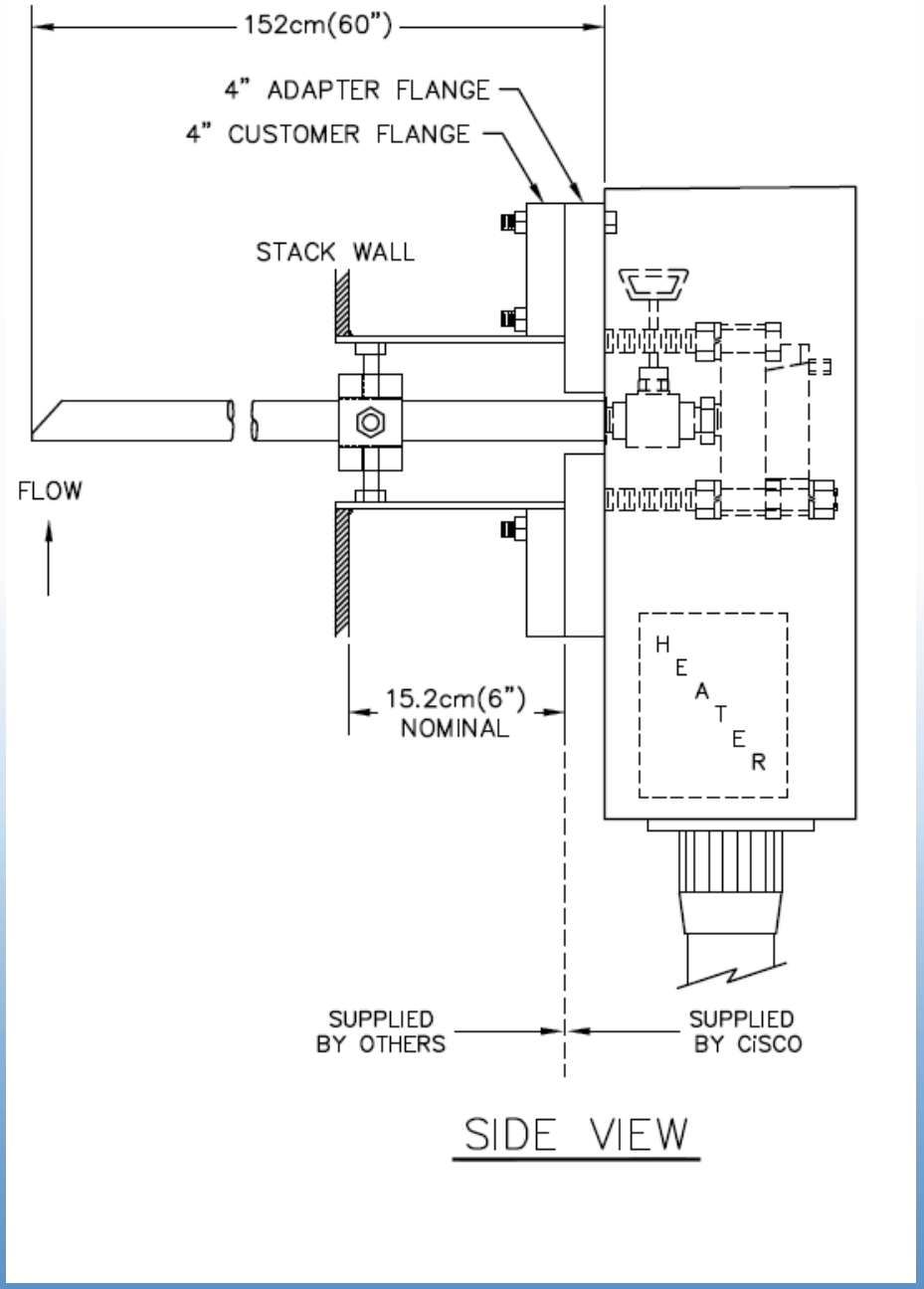
Parker Membrane Dryer

Thermo-coolers with Built-in Pumps

- CiSCO no longer will use an integrated pump with the Thermo-Cooler.
  - Pro:
    - Having the pump built into the cooler is convenient for the sake of saved space and ease of installation.
  - Con:
    - Customers have had several failures with the integrated design.
  - We have had great success with the stand-alone Masterflex pump design.
  - Maintenance of the stand alone pump is easier.
  - Recommend to any custom having the built in pumps to abandon them and use the stand alone version.

Probe Isolation Valves

- CiSCO has a design to isolate process from the probe.
- This is useful for pressurized processes, including some SCR systems
- Isolating the process gas eases the maintenance efforts including replacing the probe filter and troubleshooting.



Flow Monitor Relief Valve Failures

- CiSCO has used check-valves to relive high pressure occurrences in the flow monitor
- This was done to prevent over-pressurizing the DP transducer when an exposure to high pressure occurs.
- The check valve requires back-pressure to close properly, and so did not always close completely.
- This caused major performance issues due to incorrect pressure readings.
- We now use a proper relief valve that automatically closes after a high pressure event.
- It is recommended all customers replace their check valves with the new relief valve.

Sample Line Temperature Control

- CiSCO has used self-limiting sample lines for years.
- The downside of these lines is that the actual operating temperatures can be excessive, beyond 400F
- This can cause burnouts of the heating element and catastrophic failures.
- CiSCO began controlling sample lines using the PLC. The PLC would control the solid state power relay.
- We abandoned the PLC control because of potential for failure of the PLC output channel due to high use or spikes in the control power.
- Now using stand alone controllers

NH3 Converter Temperature Control

- CiSCO placed the NH3 Converter temperature controller in the probe enclosure for years.
- We now add control wires and thermocouple extension cable to the HSL to perform the control from inside the shelter.
- This allows the user to see the temperature and control it without having to climb the stack
- Moves sensitive electronics to a more controlled environment.
- CiSCO performing retro fits for this design.

HSL / NH3 Converter Temp. Control Enclosure

Fuse Protected Devices

- CiSCO seldom protected devices on the control power circuits and relied on device fuses in case of a power surge event, such as a short circuit.
- After a few cooked OIT panels and PLCs, we have added fuses to the 24 VDC control circuits to help protect these devices.

Using CGA Gas Cylinder Fittings with Built-in Check Valves.

- Rather than two separate items, having these built-in together eliminates failure points.
- These fittings are located on the high-pressure side of the regulator, prone to leakage due to cylinder pressures up to 2000 psi.
- Reduces cost of assembly.
- Recommended to change out old CGA fittings with separate check valves.

Air Purging

- Since the CO analyzers ranges have increased over recent years, we have had some issues with left over calibration gases in the Cal tube leading up to the probe.
- We now use instrument air to purge the lines of cal gas as part of the standard calibration sequence.
- In some cases, we will purge at the start and then again at the finish of the calibration sequence.
- Older systems can use the O2 Span valve to perform this purge, new system have a valve installed after the dry air regulator.
- It is advised to add this air purge to all systems when upgrades are being made