



ALL POWER LABS
GASIFIER EXPERIMENTERS KIT

The GEK Gasifier

Typical Vehicle Gasifier/Engine System

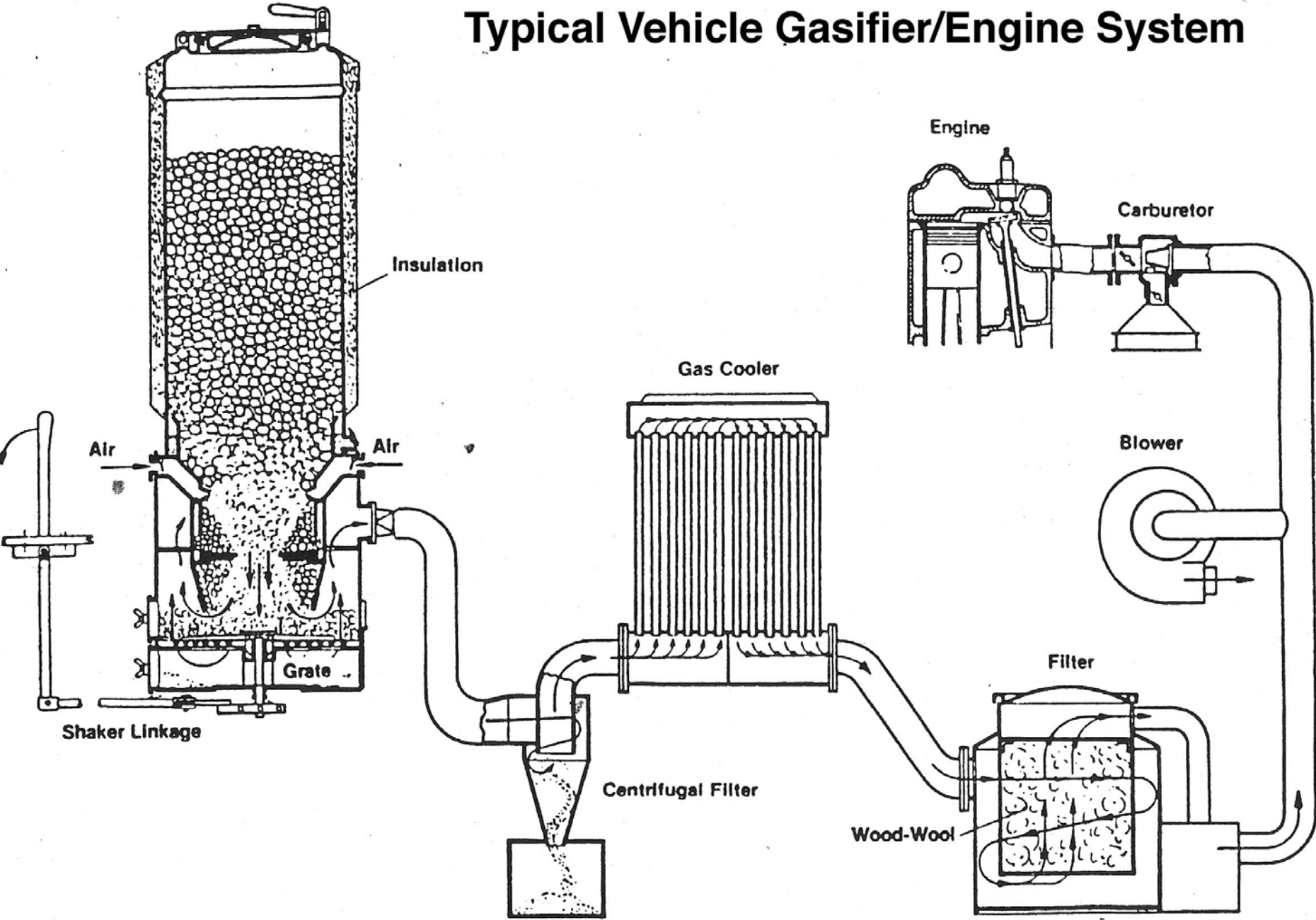
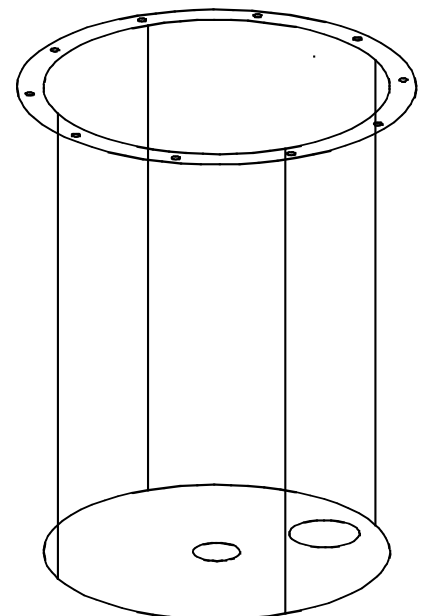
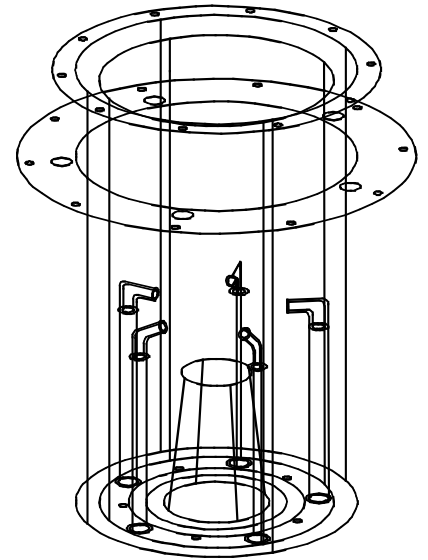
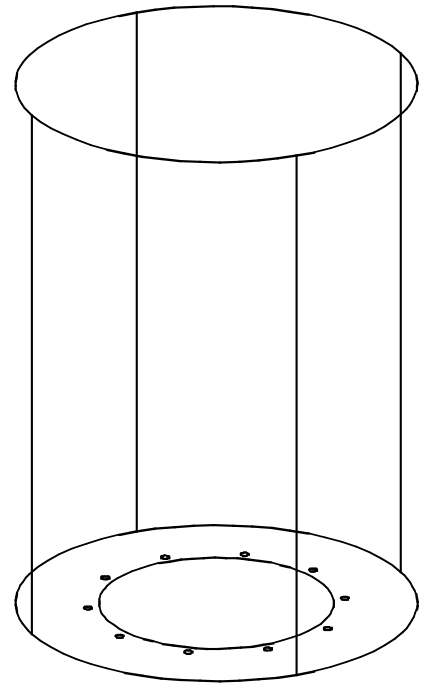
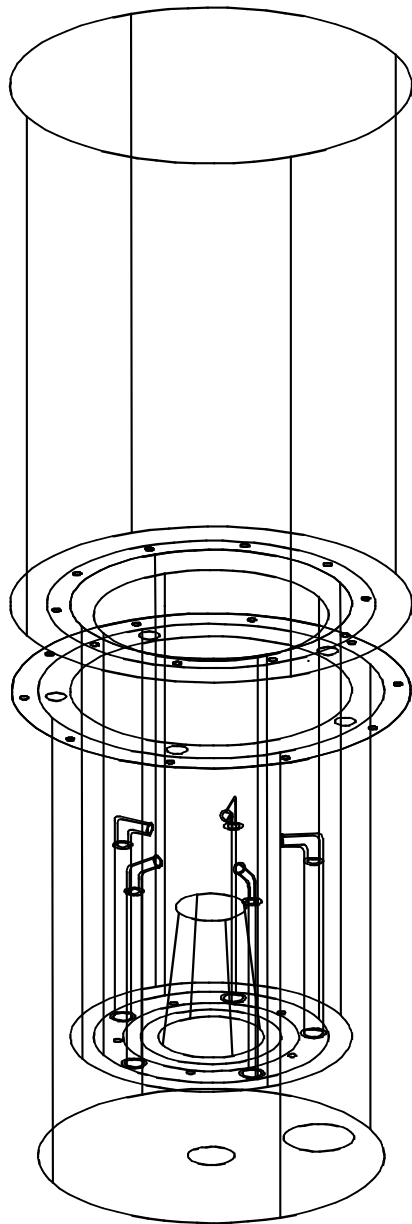
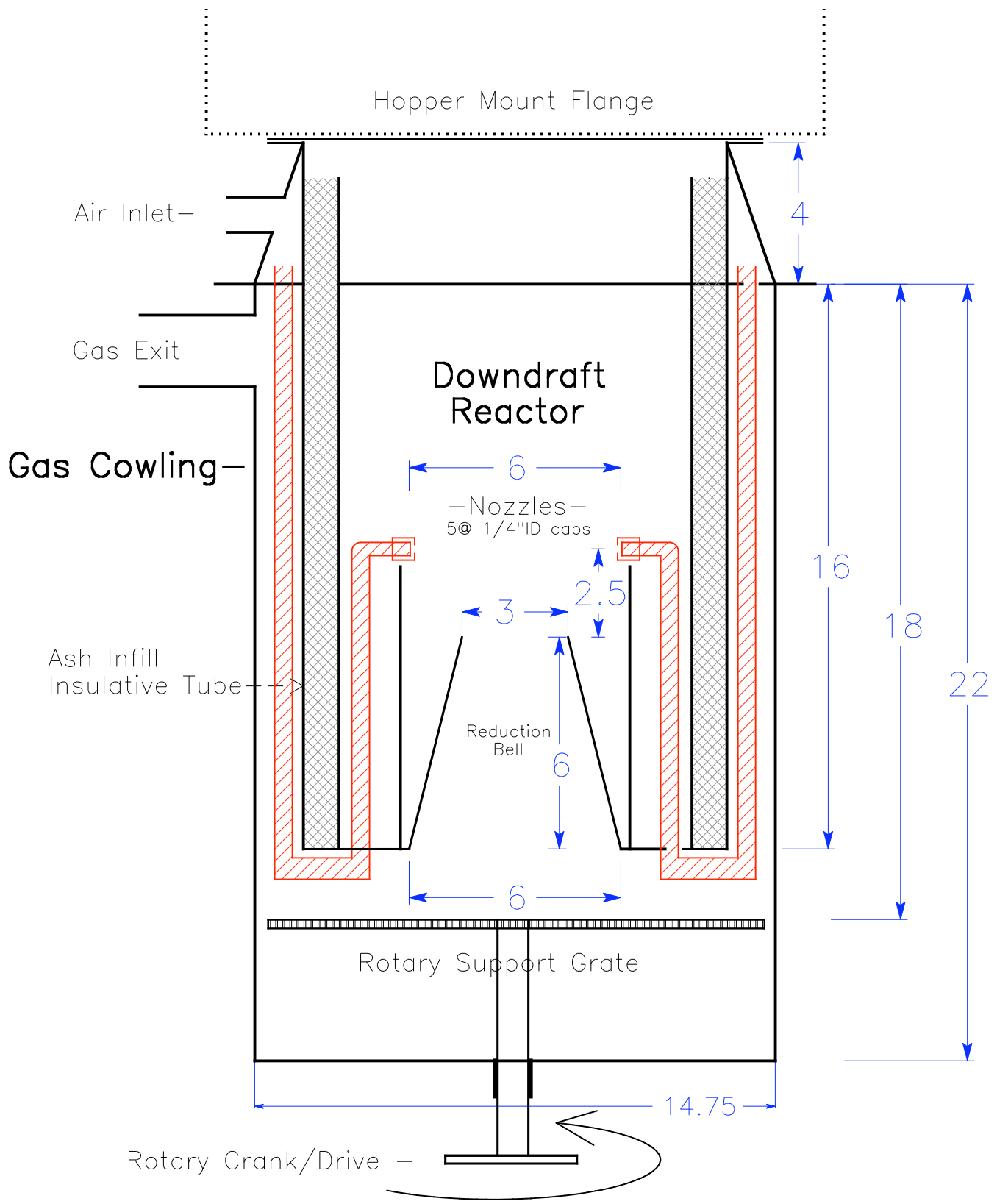


Fig. 8-3. Typical vehicle gasifier system showing cyclone and gas cooler (Source: Adapted from Skov 1974)

GEK v2.0 Main Assembly

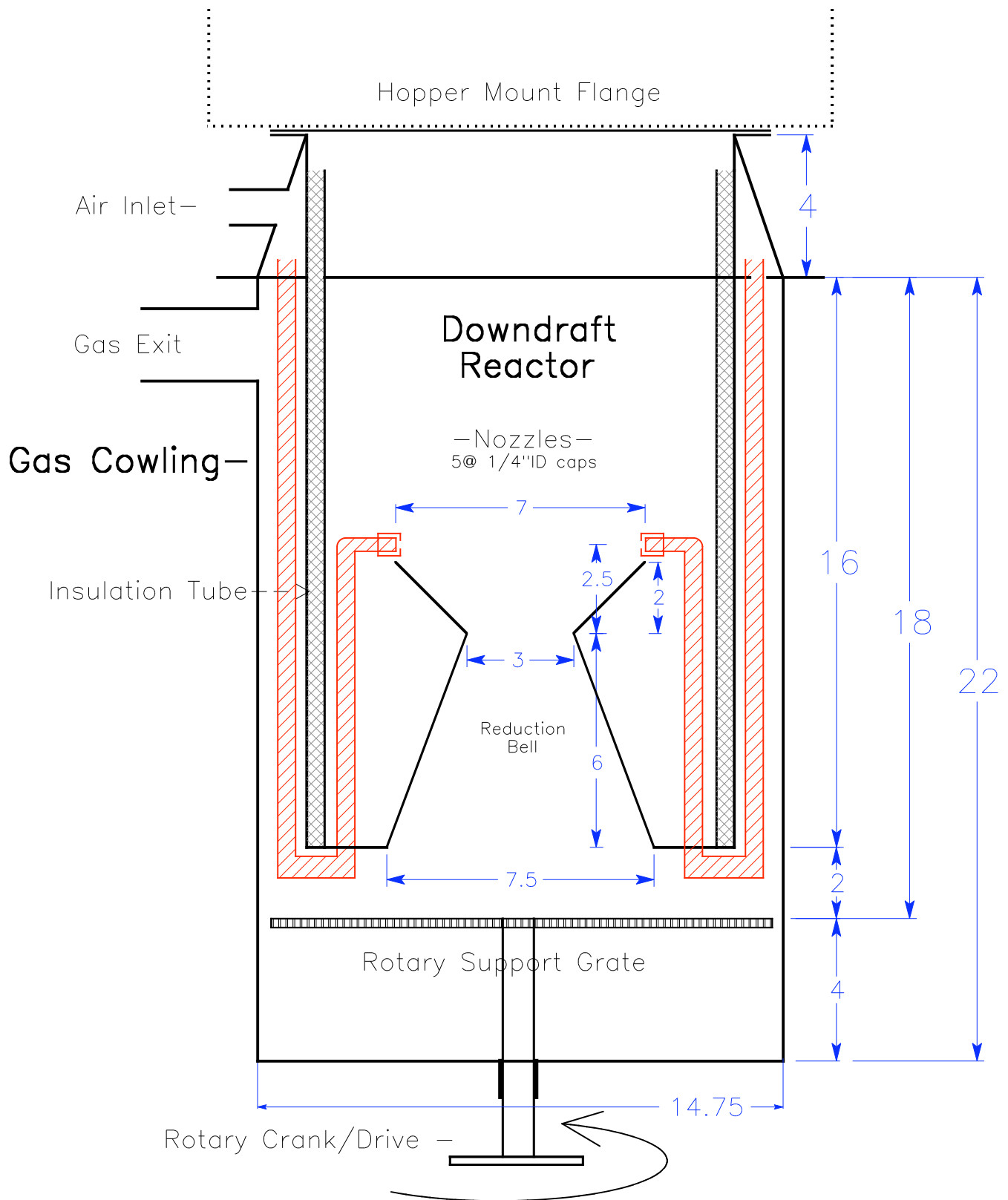
Gas Cowling, Reactor, Hopper





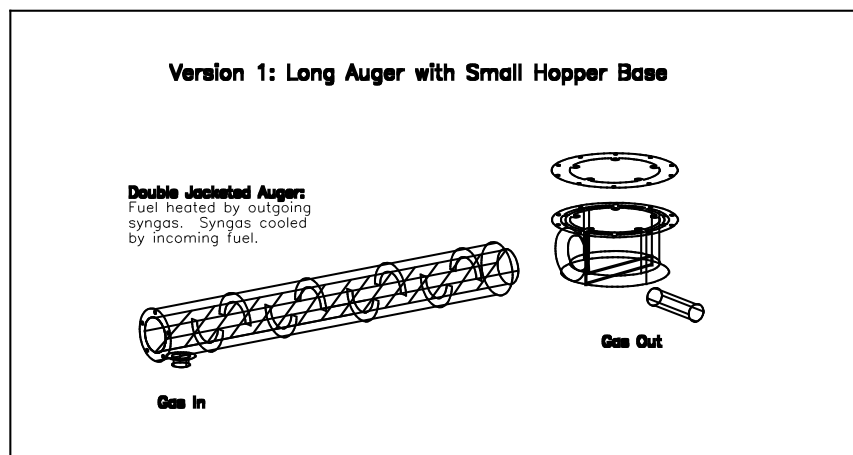
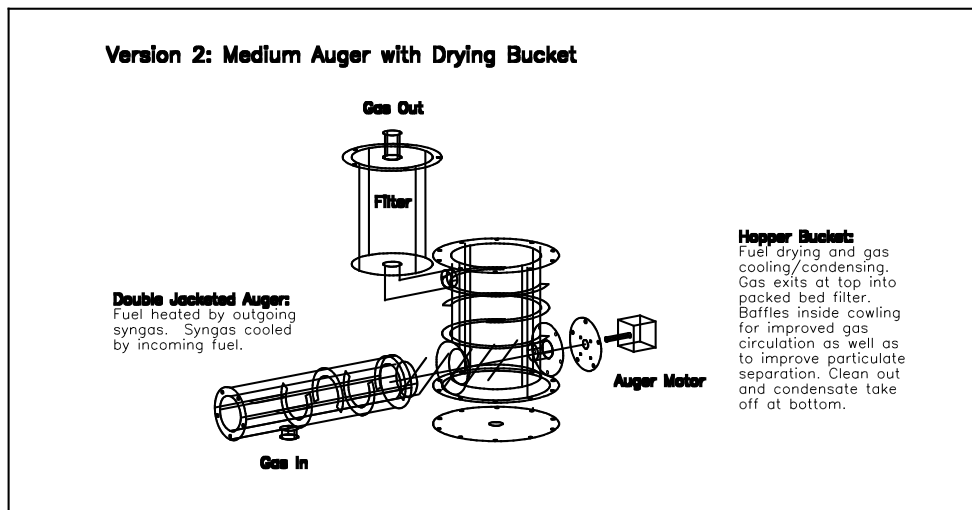
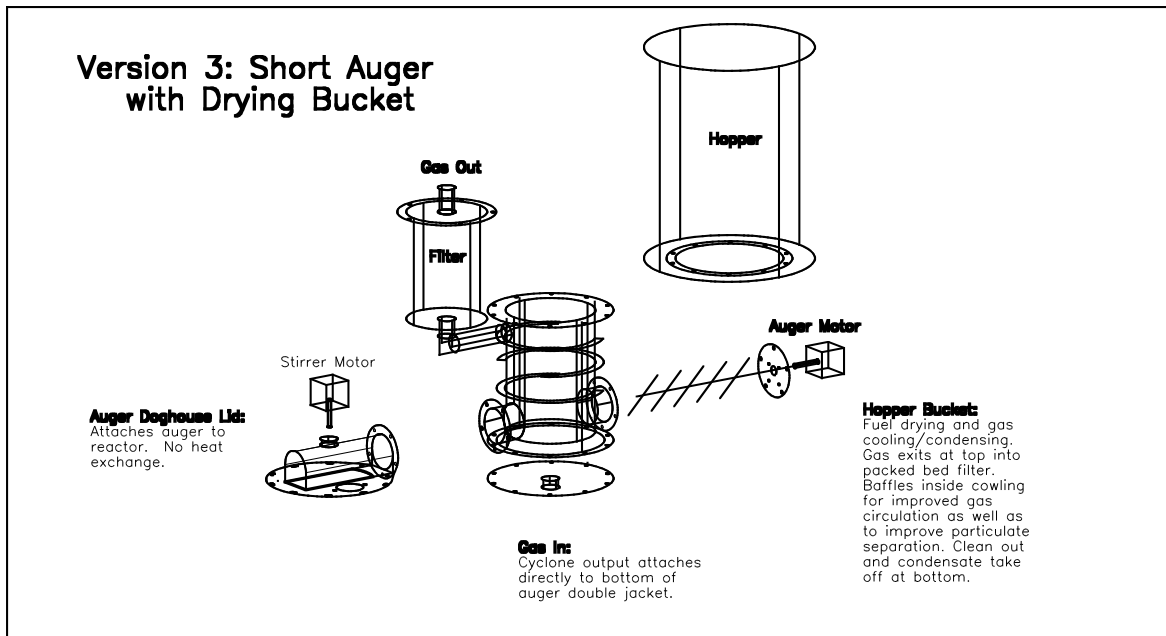
GEK v3.0 Downdraft Reactor with air preheating
3" reduction restriction configuration

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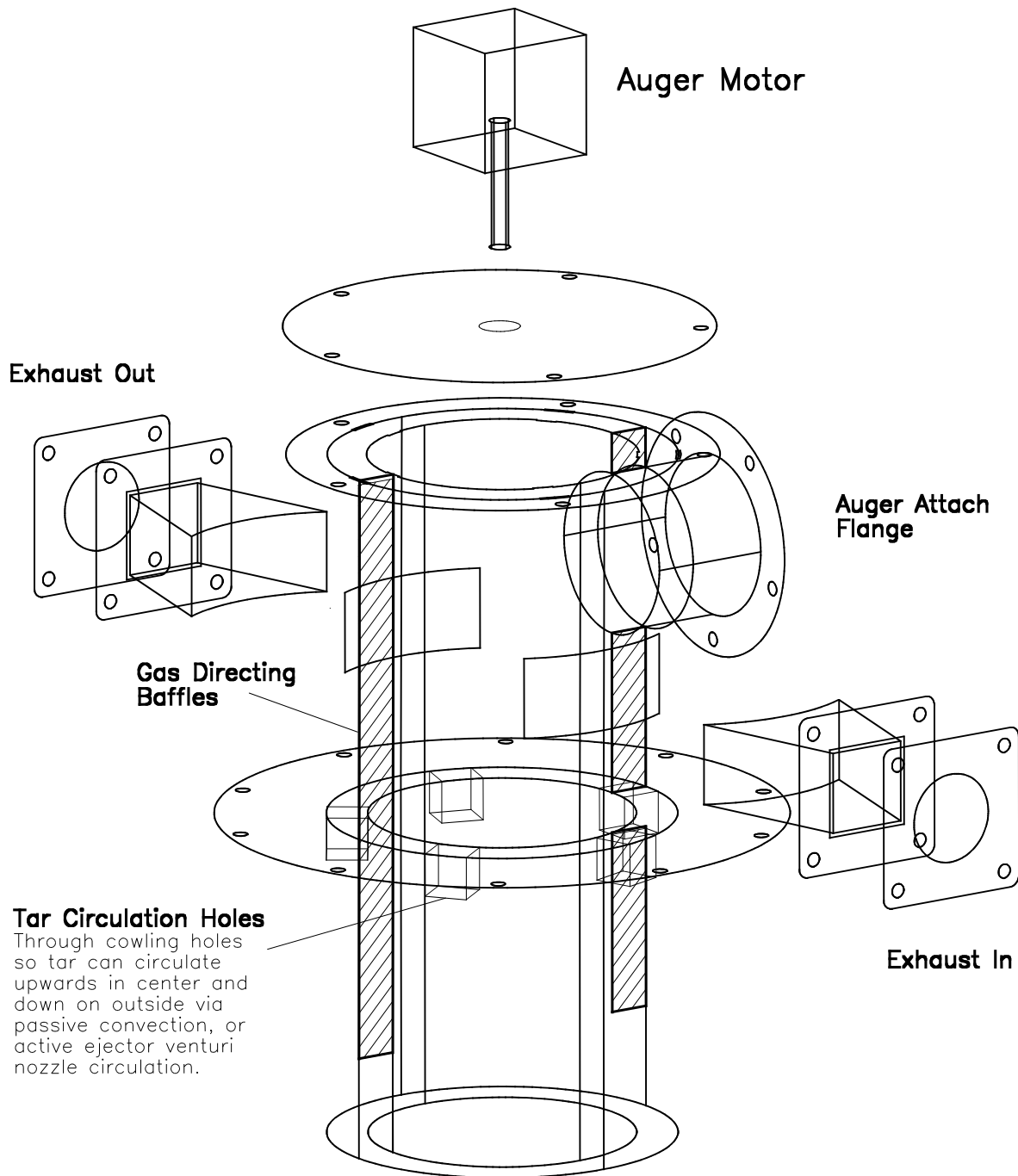
GEK 11" Reactor with J-tube air preheating
3" Imbert Hourglass Hearth

GEK Fuel Drying and Auger Feed Variations



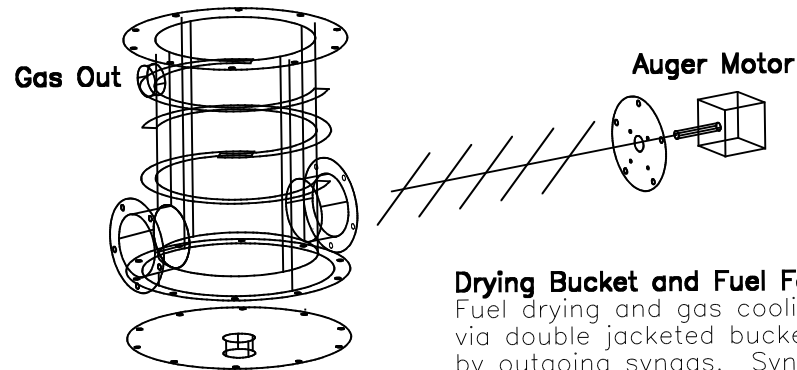
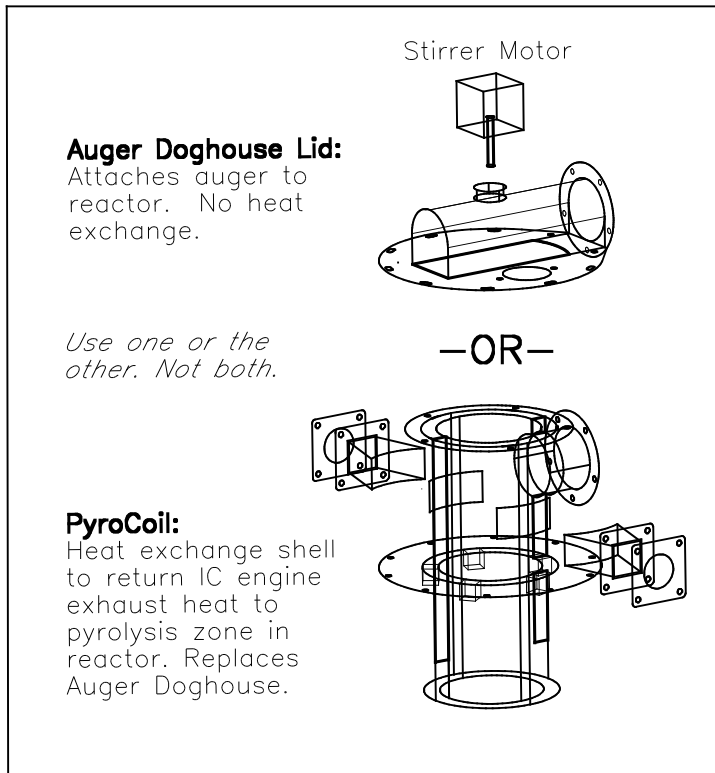
GEK PyroCoil Heat Exchanger

Double shell gas circulating heat exchanger inserts into reactor and drives pyrolysis zone with IC exhaust or other external heat source.

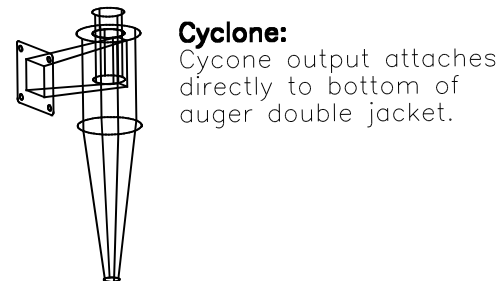


GEK Auger fuel feed and fuel drying/preheating system

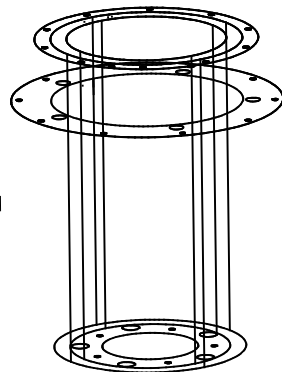
Auger Doghouse or PyroCoil reactor attachment



Drying Bucket and Fuel Feed Auger:
Fuel drying and gas cooling/condensing via double jacketed bucket. Fuel heated by outgoing syngas. Syngas cooling by incoming fuel. Gas exits at top into packed bed filter. Baffles inside cowling for improved gas circulation as well as to improve particulate separation. Clean out and condensate take off at bottom.

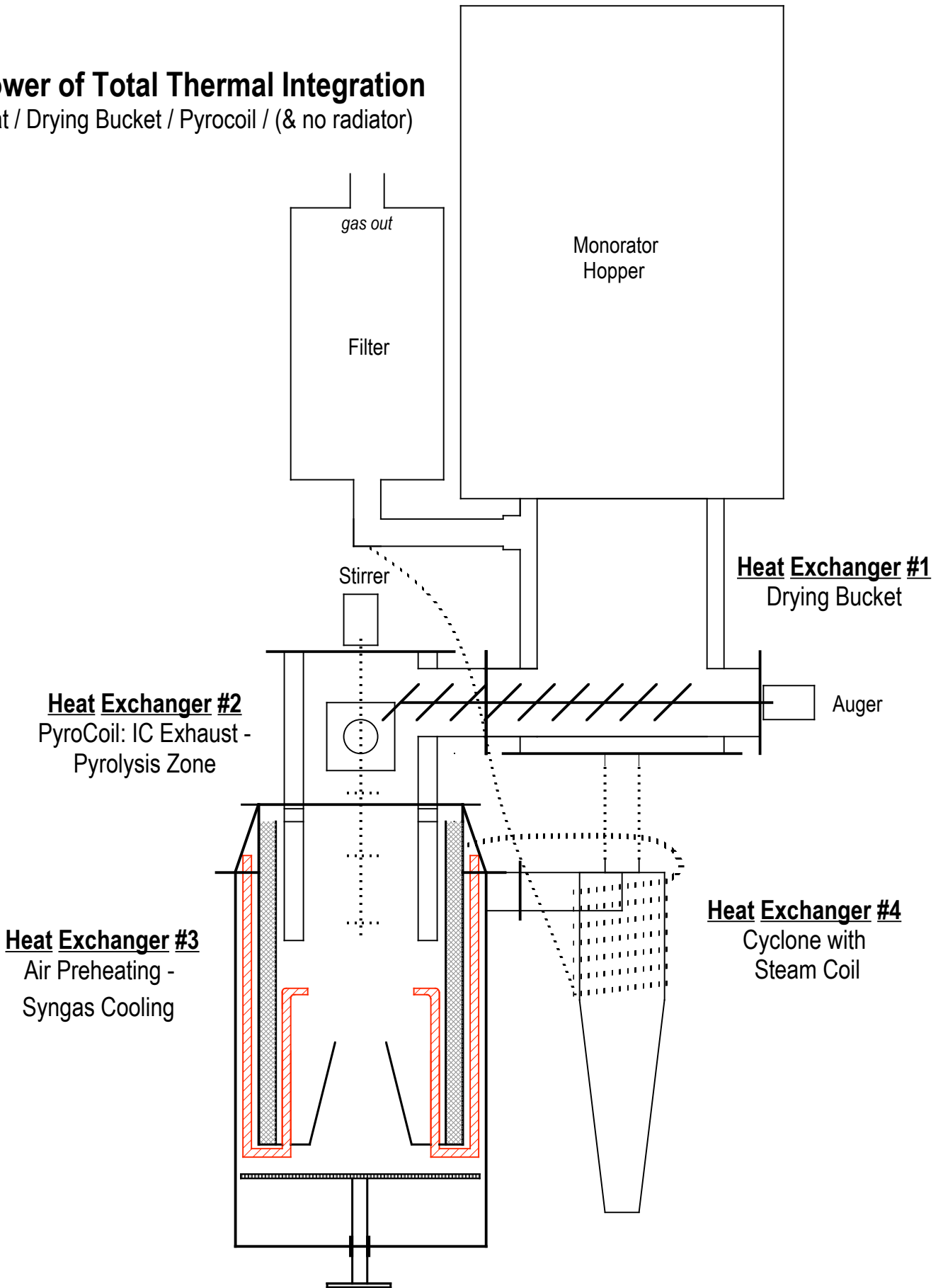


Downdraft Reactor:
Auger Doghouse or PyroCoil connects auger to reactor. Doghouse bolts to top of reactor. PyroCoil inserts down inside reactor.



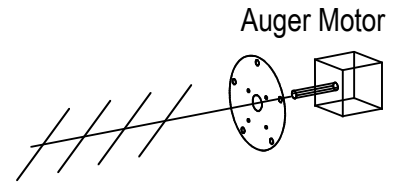
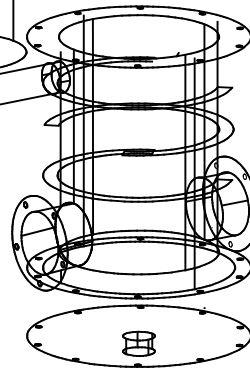
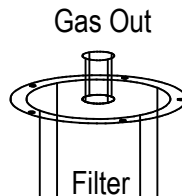
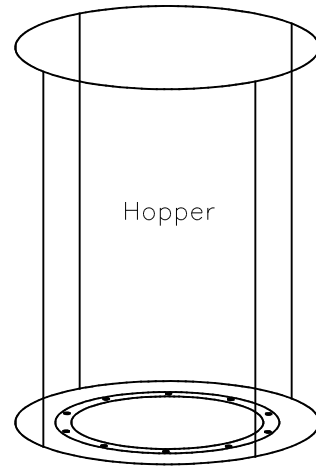
GEK Tower of Total Thermal Integration

Air Preheat / Drying Bucket / Pyrocoil / (& no radiator)



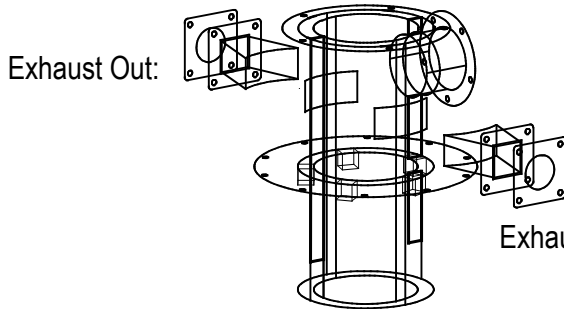
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GEK Tower of Total Thermal Integration (The Hot TOTTI)



Heat Exchanger #2 PyroCoil.

Double jacketed heat exchange shell to return IC engine exhaust heat to pyrolysis zone in reactor. Internal baffles direct flow around shell to maximize heat exchange.

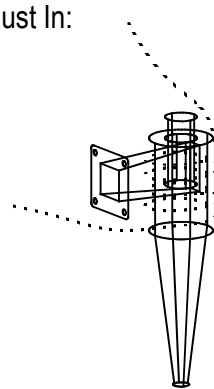
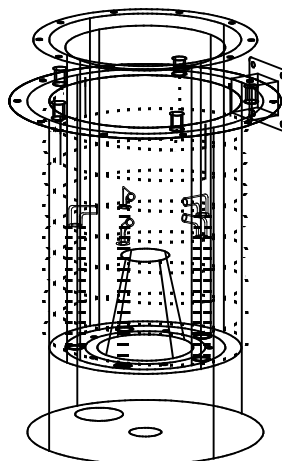


Heat Exchanger #1 Drying Bucket

Fuel drying and gas cooling via doubled jacketed vessel. Fuel heated by outgoing syngas. Syngas cooled by incoming fuel. Gas exits at top into packed bed filter. Baffles inside cowling for improved gas circulation and particulate separation.

Heat Exchanger #3 Air Preheat / Syngas cooling.

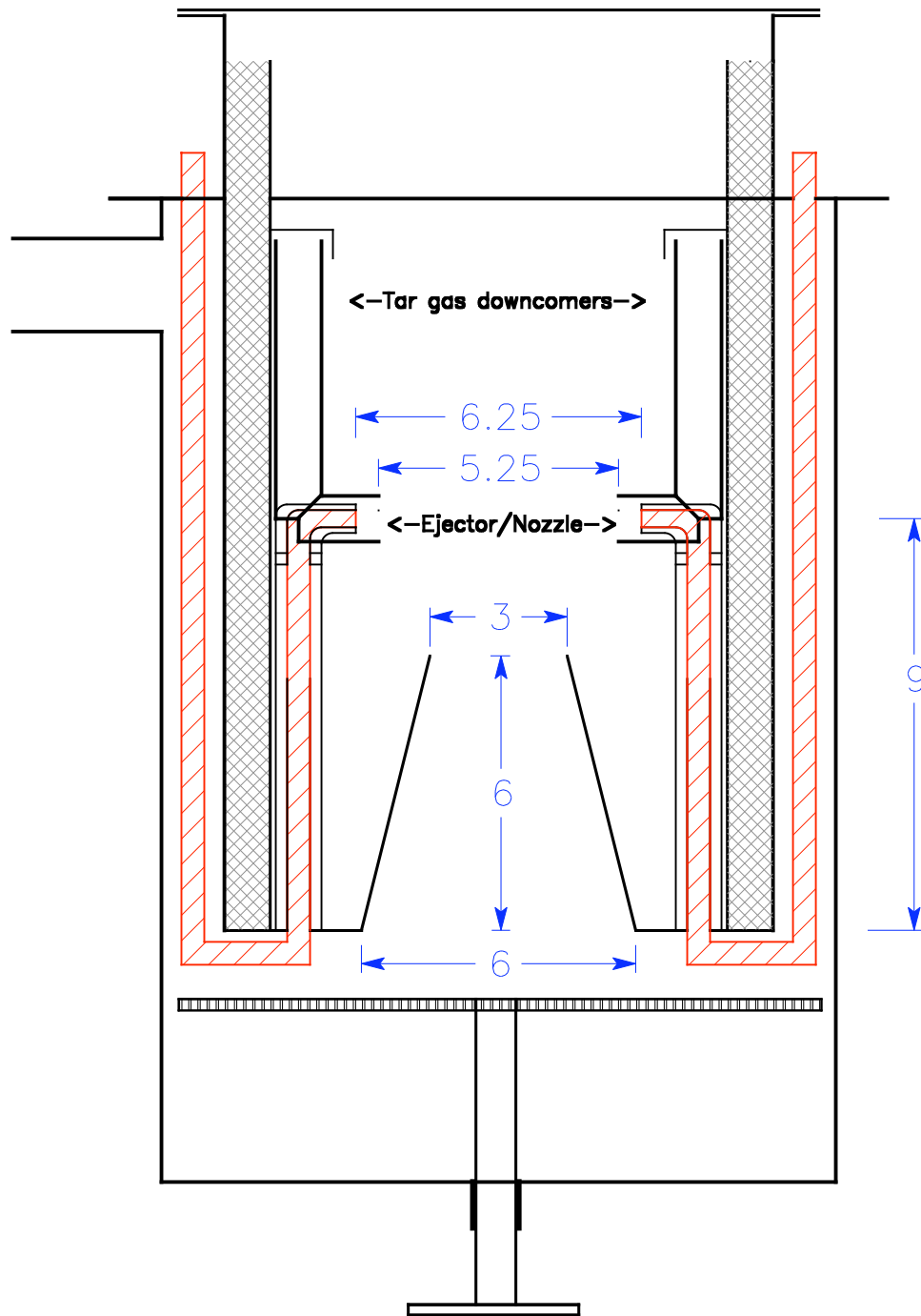
Standard GEK downdraft reactor inside Gas Cowling. PyroCoil inserts into reactor. Air intake lines made from flex corrugated ss air intake lines wrap around reactor, in annular space between reactor and gas cowling. Incoming air is heated by outgoing gas. Outgoing gas is cooled by incoming air.



Heat Exchanger #4 Cyclone with Steam Coil:

Cyclone output attaches directly to bottom of double jacketed drying bucket. Water jacket or heat exchange coil around cyclone vessel to generate steam for reinjection into reactor. Steam coil fed with recirculating filter water.

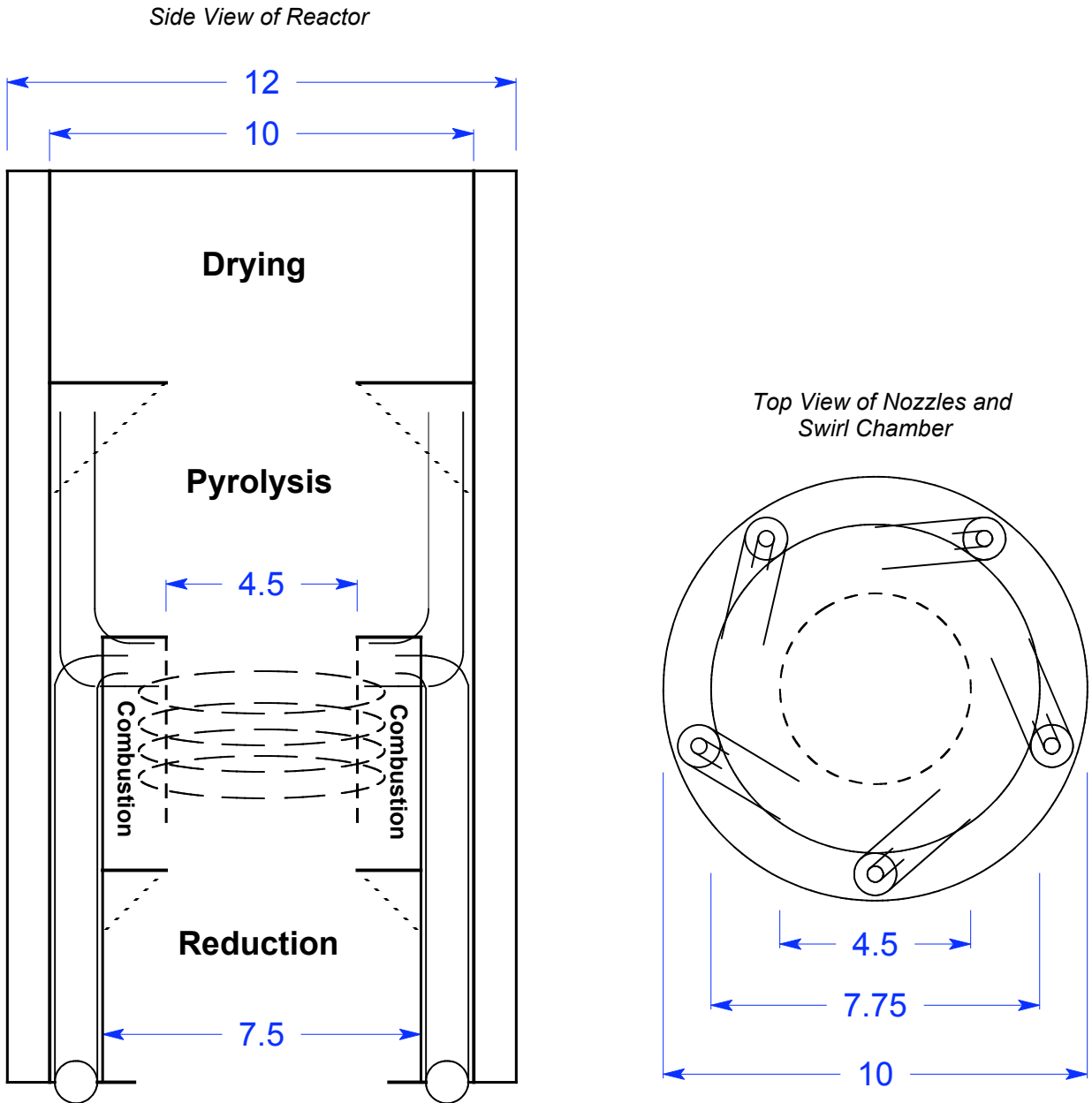
GEK Internal Tar Scavenging Ejector/Venturi Nozzles



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GEK Triple Hips Downdraft Study

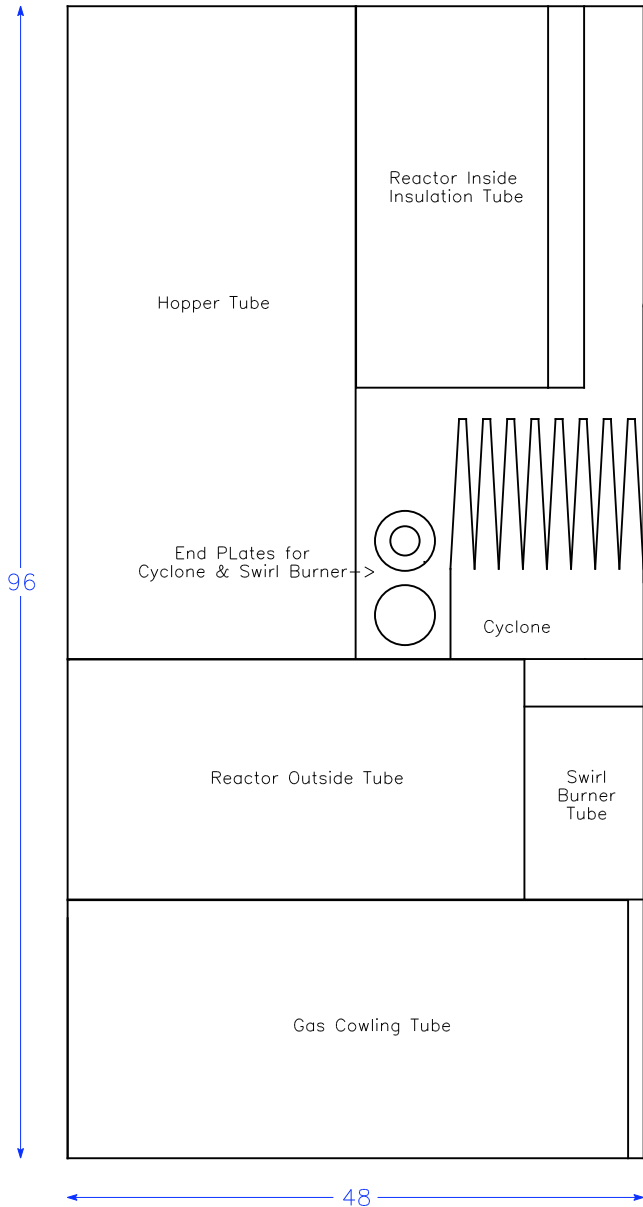
Proposed GEK downdraft reactor insert with four zone separation, internal tar recycling, upward convection pyrolysis, and open swirl combustion chamber.



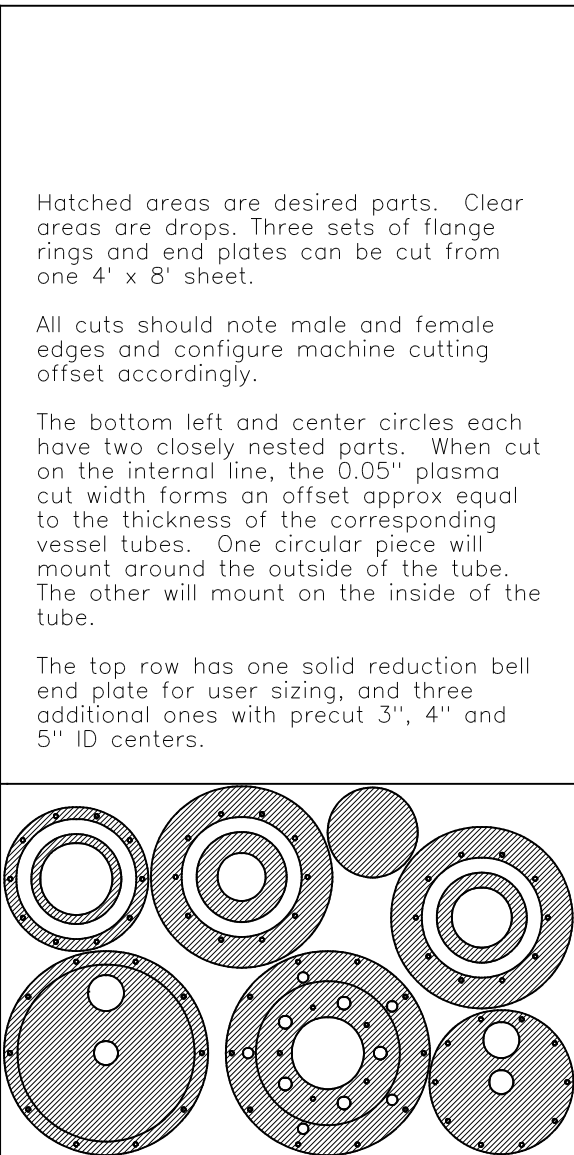
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Layout for CNC Plasma Cutting

(Cut from 1/16" thick mild steel sheet)



(Cut from 1/8" thick mild steel sheet)

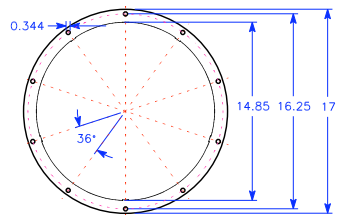


(v0.8. Before building, check www.allpowerlabs.org/gasification/gek for most recent version before building.)

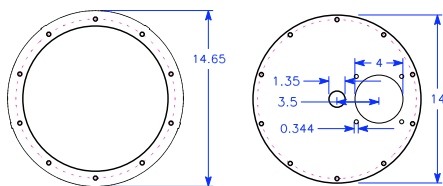
GEK Flange Rings and End Plates v3.0

(Cut from 1/8" mild steel sheet)

Gas Cowling



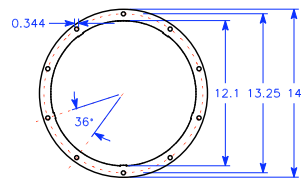
Top Rim Flange



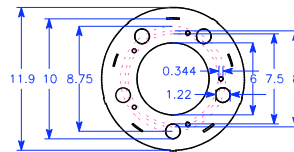
Bottom End Plate
(with grate rotation, air inlet and ash port holes)



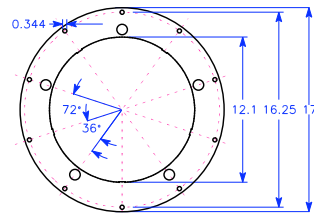
Downdraft Reactor



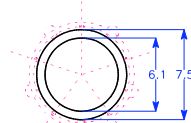
Top Rim Flange



Bottom End Plate

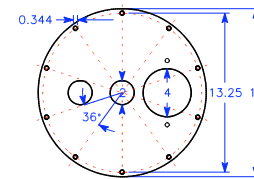


Perimeter Mounting Flange

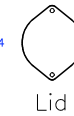


Reduction Bell End Plate
(or cut center to desired size)

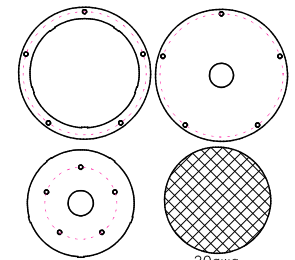
Hopper, Filter, Cyclone, Fan, Burner, Grate



Top Cover for Reactor or Hopper
(holes for fuel fill and top down air config)



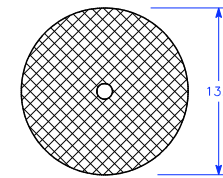
Lid



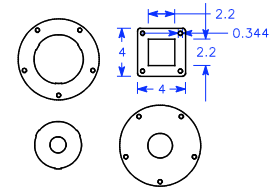
Filter, Mesh & Lid



Swirl Burner



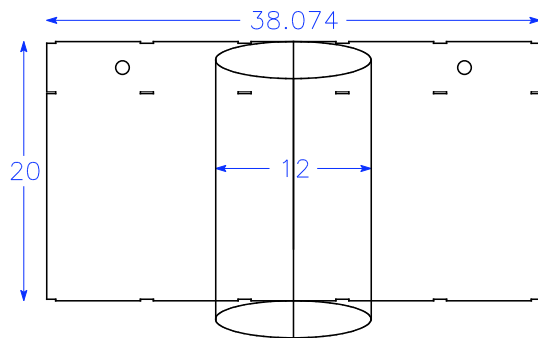
Ash Grate
1/8" thick
3/16" holes



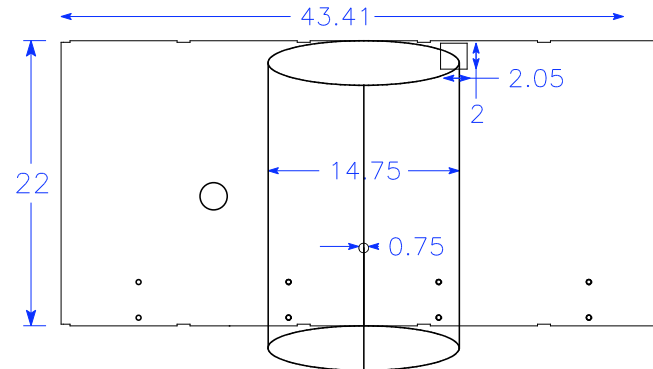
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GEK Vessel Tubes v3.0: rolled from flat sheet

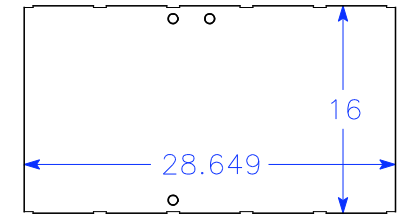
(Cut from 1/16" thick mild steel sheet)



Downdraft Reactor Outside

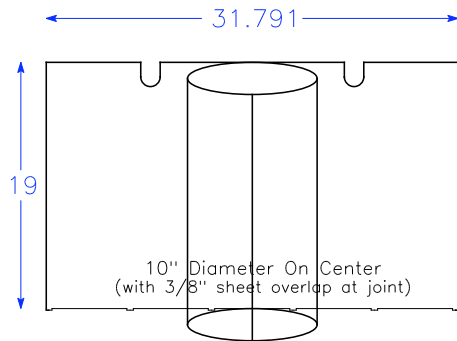


14.75" Diameter On Center
(with 3/8" sheet overlap at joint)
Gas Cowling

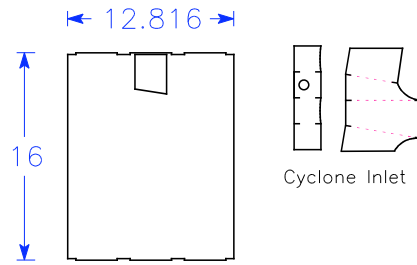


8" Diameter On Center
(with 3/8" sheet overlap at joint)

Packed Bed Filter

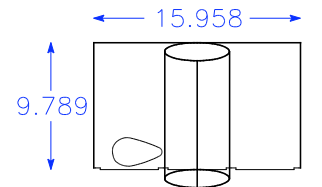


Downdraft Reactor Inside/Insulation



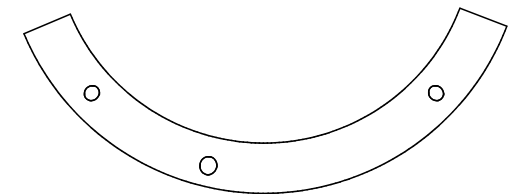
4" Dia cylinder"
(with 1/4" sheet overlap)

Cyclone



5" Diameter On Center
(with 1/4" sheet overlap at joint)

Swirl Burner

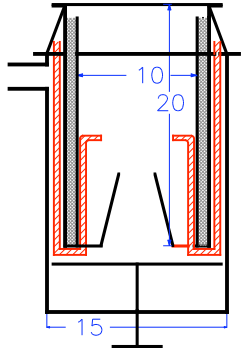


Air Neck

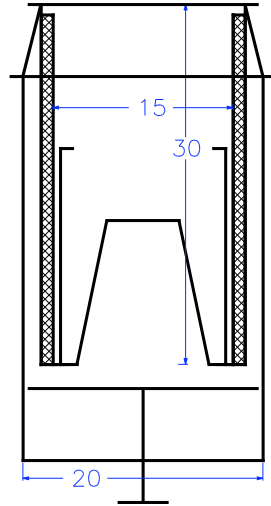
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GEK Scale-up Sizing Steps

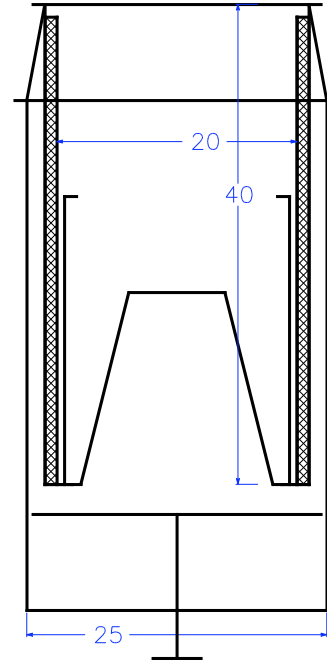
Each step based on common north american tank sizes.
Gas flow rates estimated with traditional Imbert sizing chart



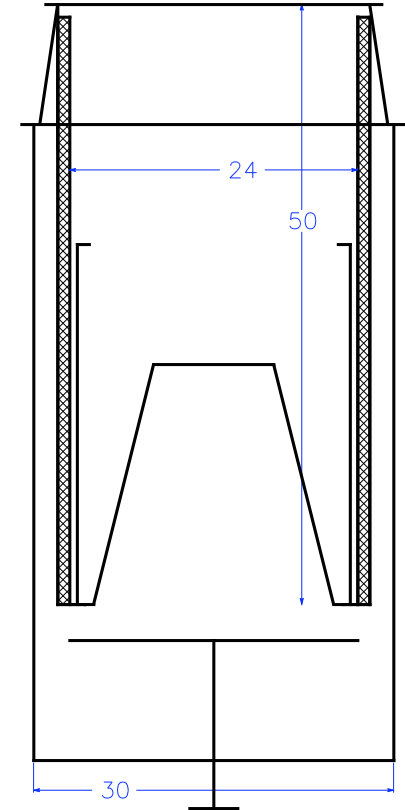
Small Block GEK
2.5–**3**– 4 inch
constriction



Big Block GEK
4–**6**– 8 inch
constriction



Mountain GEK
6–**8**– 10 inch
constriction



Merlin GEK
8–**10**– 12 inch
constriction

Biochar Experimenters Kit (the BEK)

Multiple mode Pyrolysis Reactor for characterized Biochar making

Full System for \$4395. 10% off on purchases during conference

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