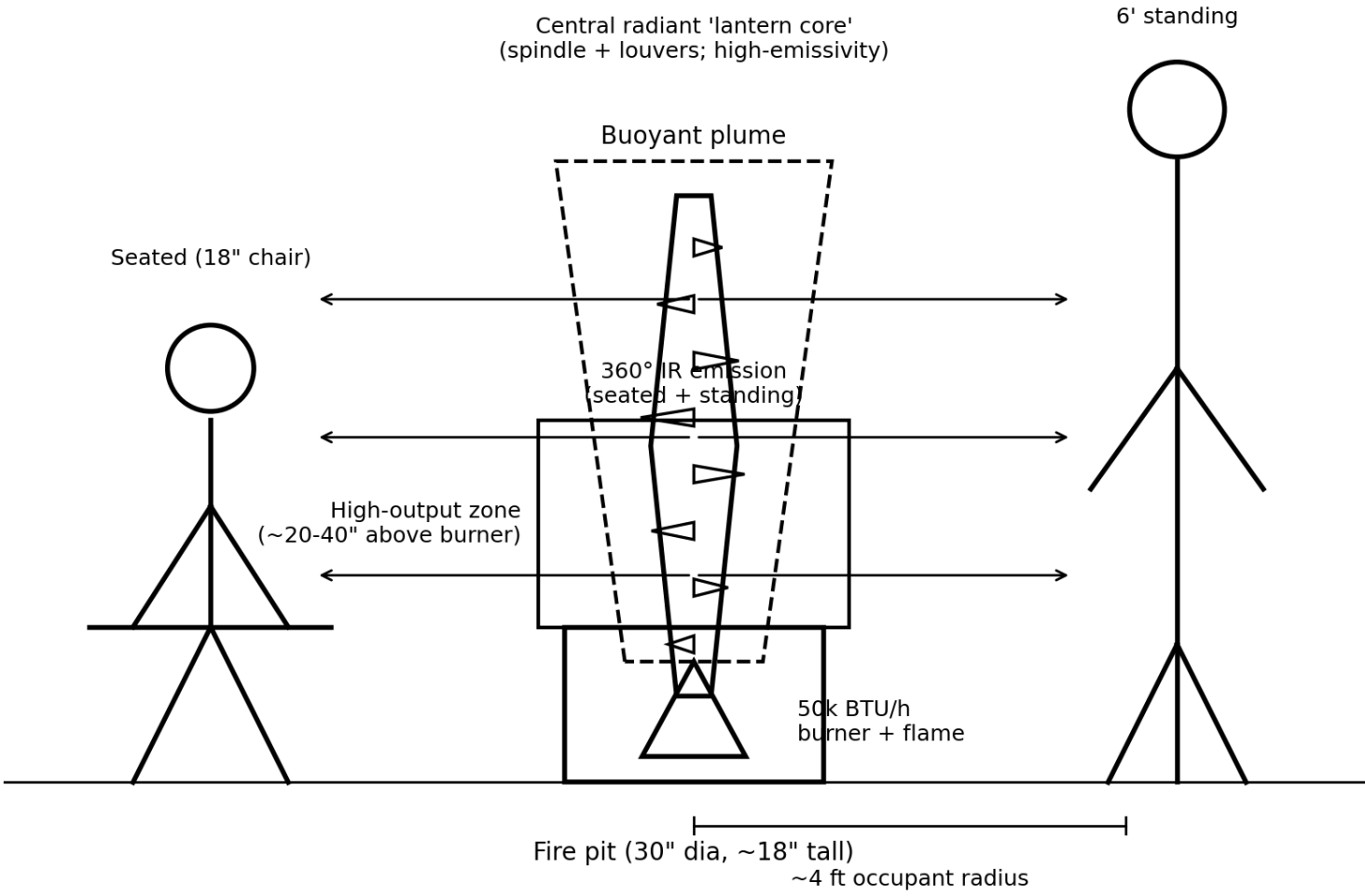
Radiant Core Insert: 360-degree IR at Multiple Heights

Goal: convert a portion of the hot plume into omnidirectional IR at both seated and standing body heights (50k BTU/h example).



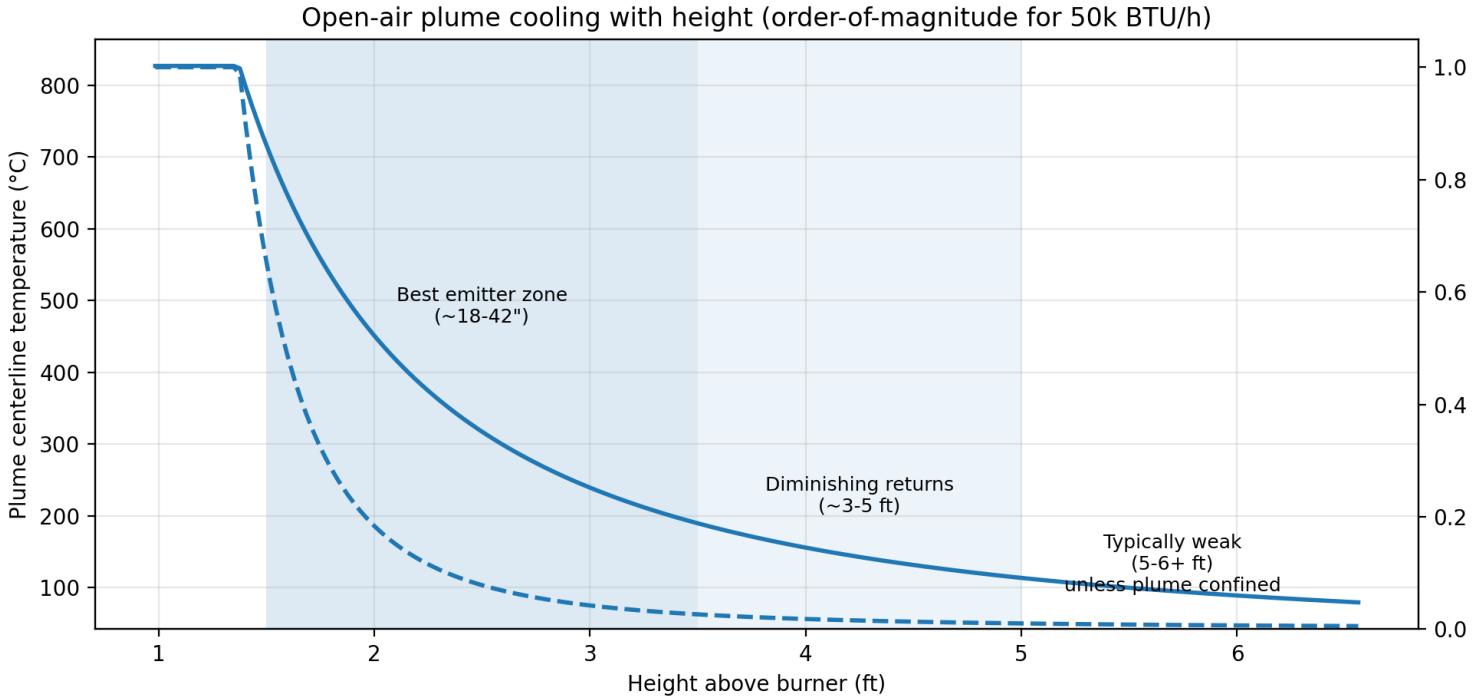
Design intent and shape

- Geometry: a biconic (spindle) core with alternating louvers/fins. The plume heats the core by convection; the core emits IR in 360 degrees.
- Multi-height comfort: louvers create multiple 'emission bands' so seated legs and standing torsos see hot surface area simultaneously.
- Reflectivity is optional: if the surface becomes sooty/matte, emissivity rises and the core still radiates strongly. You lose specular aiming, not the fundamental heating channel.
- Recommended prototype envelope: 8-12 in max OD; active height 24-40 in above burner; keep clearance to avoid direct flame impingement hot spots.
- Materials/finishes: 316 SS for early builds; 309/310 SS or Inconel for higher margin; oxidation-stable high-emissivity coating (black ceramic) for predictable IR.

Engineering note: any insert must be validated for combustion safety (CO), stability, clearances, and local code compliance.

How High Can the Plume Drive Useful IR?

Open-air plumes cool rapidly with height (entrainment). Confinement extends height, but changes draft, CO risk, and hot-surface safety constraints.



Rule-of-thumb height guidance (50k BTU/h, open air)

- 2 ft: realistic for strong IR conversion (sweet spot).
- 3 ft: workable but reduced surface temperature/IR unless wind is low and plume stays centered.
- 5-6 ft: typically weak in open air; temperature and IR potential collapse quickly with height.
- If you focus/contain the plume (funnel/stack): 4-6 ft becomes feasible, but you must incorporate an emitter section and manage draft, CO, and hot-surface clearances.

Plot is an order-of-magnitude estimate (buoyant-plume scaling). Actual values depend on burner geometry and wind.