

METHANE FROM FLARING TOOLKIT



Flare Design: Staged flare designs

How is the flare designed to minimise methane? > Flare Design: Staged flare designs

A staged flare design utilizes a smaller capacity flare to handle flaring requirement during normal operation, maintenance, and start-up cases; and a larger capacity flare to handle emergency flaring requirements.

How it works

- A staged flare systems consisted of two or more flares so that the number of flares in operation is proportional to the gas flow.
- The first stage in a staged flare system is typically designed to handle the normal operation, maintenance, and start-up cases. The second stage is generally designed for emergency relief cases.
- Staged flares operate based on pressure or flow. A staging valve or drum is used for staging between the first stage and the second stage.

Types of staged flares

Staged flare systems can include the following:

- Multi-point ground flares (Figure 1)
- Enclosed ground flares
- Combination of multi-point ground flares/ enclosed ground flares and elevated flares (Figure 2)



Figure 1: Example of multi-point ground flares installed for LNG service



Figure 2: Example of a staged flare system consists of an enclosed ground flare (first stage) and an elevated flare (second stage)

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Advantages



Low – most stages are typically closed until required to open for an emergency relief scenario. A continuous purge flow is only required for the first stage; therefore, lowering emission from purging

Limitations



Sufficient plot space would be challenging, especially for existing facilities



Design variability – each stage can be designed to meet the process requirements



High turndown capacity – limit equipment downtime



Long equipment service life – equipment associated with second and successive stages operate less often; hence, increasing the life span of these items

Go Deeper

- [Vendor website: John Zink Hamworthy](#)
- [Vendor website: Zeeco](#)
- [Vendor website: Questor](#)

Case study

Awaiting copyright approval

How is the flare designed to minimise methane?



Flare Design: Pilots



Flare Design: Air-assisted flare



Flare Design: Nitrogen Purge



Flare Design: Sonic tips with fixed exit slot



Flare Design: Sonic tips with variable exit area