



## **Combustion Equipment – General Descriptions**

### **A. Utility Flare – Guy Wire Supported**

Designed for compressor blow down, emergency pressure release and flows that do not contain any liquid content. Underground/above-ground knockouts can be placed in front of these flares, and they can be equipped with any Tornado ignition option. A larger foot print is required to accommodate the guy wire support system.

### **B. Utility Flare – Small Integral Base Knockout**

Designed for small oil batteries and processes that can generate marginal amounts of hydrocarbon or water condensate. These small integral knockouts prevent the riser from freezing frequently from small amounts of condensate and will also retain liquids from spilling onto the surrounding ground area. These flares can be equipped with any Tornado ignition option, and can be guy wire or self-supported depending on available site conditions.

### **C. Utility Flare – Large Integral Base Knockout**

Designed for gas well locations where high volumes of gas are blown down for maintenance reasons. The large integral base knockout ensures that condensates flowing from the well are contained in the knockout and not sprayed around creating extremely dangerous conditions. These units can be guy wire or self-supported depending on available site conditions.

### **D. Utility Flare – Self-Supporting, Tapered**

Designed for applications with space restrictions or aesthetic concerns. Most stacks of all types can be built self-supporting, generally to a range of 100-feet tall. Tornado will engineer the right system for you and provide the structural loads; customers provide the foundation and base.

### **E. Smokeless Flare – Air Assist**

Designed to dispose of heavy hydrocarbons without creating smoke (the product of unburnt hydrocarbon particles). Air-assisted flares use a mechanical drive blower to force air into the waste gas stream, or to segregate the hydrocarbon streams into multiple small channels which are designed to allow oxygen influx. Achieving better fuel and oxygen content ratios enables the flare to completely combust the hydrocarbon molecules, thus eliminating any smoke.

### **F. Smokeless Flare – Gas Assist**

Designed to supply the right amount of BTU content to generate combustion temperatures needed to thermally destroy waste gas streams. Acid Gas applications (a low BTU gas stream) are the prime use of gas assist flare tips where it is considerably more effective to equip the stack with a ring burner. The ring burner creates a flame envelope at the flare tip which the acid gas must burn through when exiting. The design of the ring burner causes high turbulence and mixing at the tip while maintaining a very stable high temperature flame. Ring burners can potentially save thousands of dollars in fuel gas costs in specific applications.

### **G. Smokeless Flare – Steam Assist**

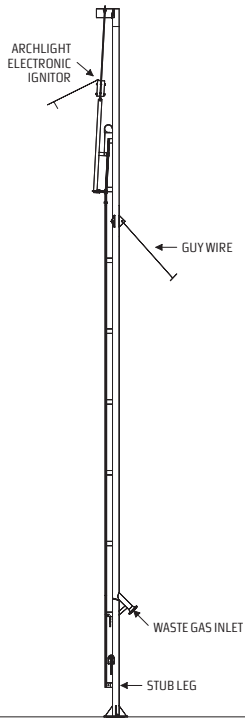
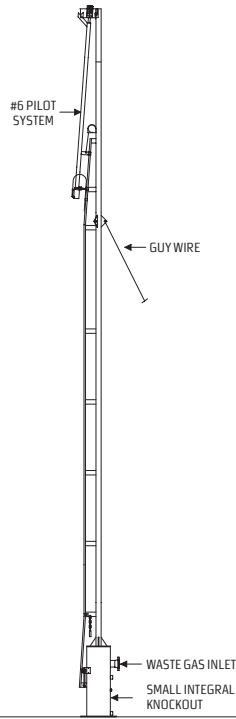
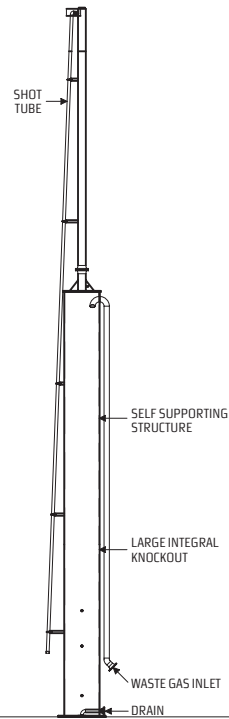
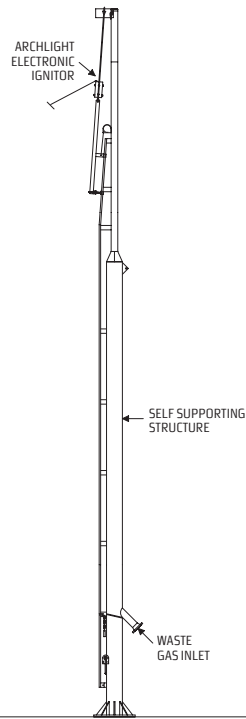
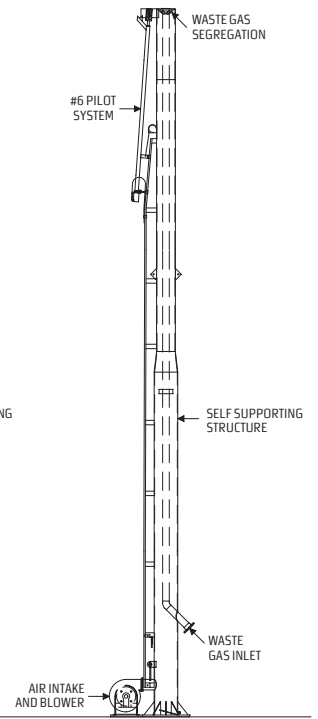
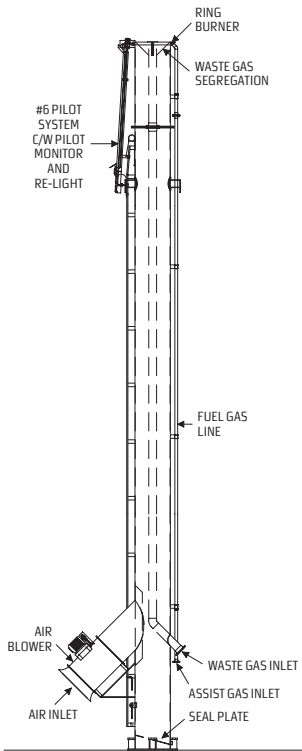
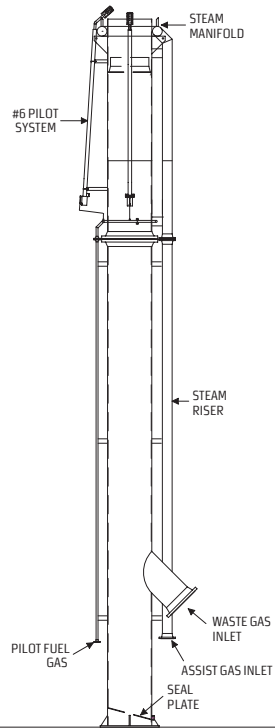
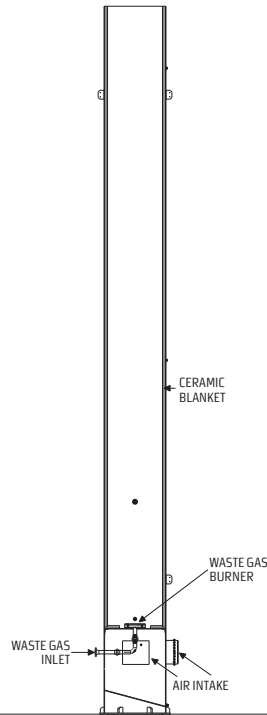
Designed to dispose of heavy hydrocarbons without creating smoke, generally used where steam is readily available onsite. Similar to air-assist flares, high pressure steam forces oxygen into the waste gas stream to assist with complete combustion of the hydrocarbon particles.

### **H. Enclosed Ground Burner**

Designed for applications where there are less toxic and higher volume waste gases to be disposed. The enclosed ground burner allows internal burning of gases without a visible flame which local residents could see. The enclosed burner also increases combustion efficiency to higher levels such as 99.8% destruction efficiency. Enclosed flares eliminate smoke and odour problems, and are generally a simpler design with fewer controls. Enclosed flares are generally used in loading terminals, oil batteries, cleaning terminal, production testing and many applications where the residents are annoyed by visible flames. These burners are becoming more popular because of their improved combustion efficiency and their reasonable price range.

### **I. Incinerator/Thermal Oxidizer**

Designed for applications where toxic or hazardous vapours must be disposed of to the highest level of destruction efficiency. Many of these substances become safe if subjected to proper thermal destruction. Incinerators are fully automated to maintain temperatures and retention time so that thermal breakdown (conversion) can occur. Tornado incinerators are custom designed for each specific location based on conditions, composition and flow rates. Many configurations are available to address regulations and concerns.

**A****B****C****D****E****F****G****H****I**