Limitations

Bending or Movement of the Laser Beam

Certain atmospheric conditions can cause phenomena known as "refraction" and "scintillation" to occur inside a pipe. Refraction is the bending or deflection of a laser beam from a straight line caused by air settling in layers of different temperature (see Figure Q). The beam tends to bend toward the denser cooler air. Hot pipe placed in a cool ditch can create layers of air with different densities. Equipment exhaust or gasket compound fumes can also settle in the ditch and cause bending of the beam.

Scintillation is the dancing or wavering of the beam as it passes through air layers of different temperature, similar to the shimmering effect seen when looking down a paved road on a hot day. Scintillation can also be caused by variations in air density due to velocity of air movement (see Figure R).
With no air flow, refraction or temperature scintillation may occur and with too much air flow, velocity scintillation may occur. The intensity and frequency of these effects can vary with the depth of cut, the type of pipe, weather conditions, length of the run, and the position of the sun.

The AGL Blower is used to blend the layers of air and reduce the effects on the beam. In addition, the following field procedures have been found to reduce refraction and scintillation problems:

1. Keep the pipe backfilled as it is laid. This helps insulate the pipe and prevents extreme temperature variations.
2. Mount the blower just outside the pipe. Adjust leg height and blower position to direct maximum airflow through the pipe. Adjust the blower speed for the pipe size.
3. Turn the blower on after laying 50' of pipe out from a manhole. On second day setups, turn the blower on for a few minutes prior to laser use to stir up the air in the pipe and purge the pipeline.
4. The desirable air velocity through a pipe for laser use is approximately 4 - 6 mph.

In severe conditions, even with the effectiveness of the blower, the working range of the laser can be limited.

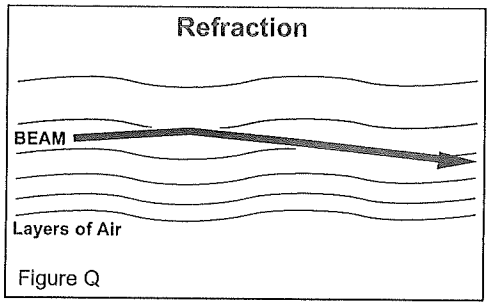

Figure Q

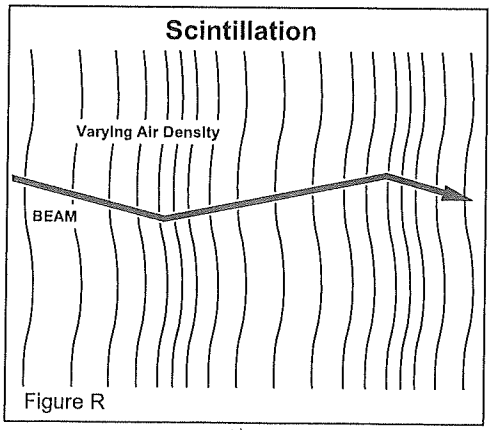

Figure R