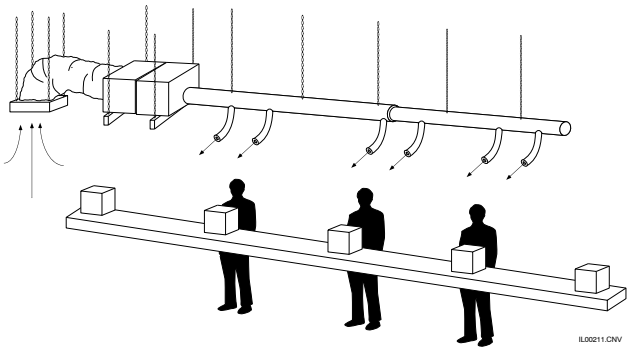
Spot Cooling Applications with Uni-Spot

INTRODUCTION

This Technical Note provides basic guidelines for Uni-Spot, the spot cooling application using the Unico System. This bulletin does not discuss human comfort parameters. This is discussed in great detail in the ASHRAE Fundamentals Handbook and other sources.

Factory spot cooling.



In all the studies we conducted, worker productivity improved, absenteeism and turnover was reduced, and the employees generally had a better outlook on their job.

Because Uni-Spot only cools personnel and not the surrounding space, it is not possible to calculate the load. However, it is possible to obtain reasonable comfort by following the guidelines presented in this Bulletin.

PLACEMENT

- Locate outlets within 3 feet of work station
- Aim at 45°
- For moving person, place every 3 feet

It is extremely important to position the outlets so that the person feels the stream of air. The outlets should always be placed where the person can redirect the air stream. Normally, this means the duct is from 3 to 5 feet from the person.

Table 1 and 2 lists the throw and coverage of a normal outlet at 40 and 30 CFM. Since the branch runs are very short, the actual airflow and throw could be much higher. Without any duct, an outlet can blow as much as 60 CFM. Unico recommends branch runs of 3 to 5 feet to maximize the airflow. For remote workstations, the branch runs can be up to 35 feet, but the airflow will be reduced. Therefore, more outlets need to be added to overcome the reduction of air.

Table 1. Throw and Coverage at 40 CFM

Distance, ft.	Velocity, ft/min	Coverage Diameter, inch
0	2000	2
7	200	6
10	150	8
12	100	12
20	50	18

Table 2. Throw and Coverage at 30 CFM

Distance, ft	Velocity, ft/min	Coverage Diameter, inch
0	1500	2
5	200	4
8	150	8
10	100	12
14	50	18

It is not necessary to completely cool the surrounding area or the full body of the individual. Normally, it is best to cool the head and upper torso. You will get the most coverage by angling the outlets at a 45° angle rather than from directly overhead.

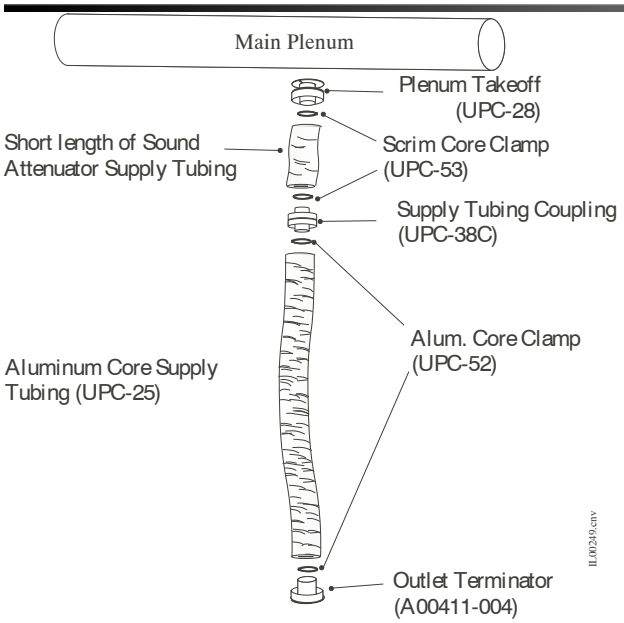
If the person to be cooled moves about, it is necessary to place an outlet at least every 3 feet in their work area; otherwise the airflow will not be felt.

DUCT DESIGN

- Use Supply Tubing with a short length of Sound Attenuator to relieve any bending stress at the takeoff
- Use 9-inch metal plenum, insulated
- Use “flangeless” black terminator
- Use 100 percent outside return air

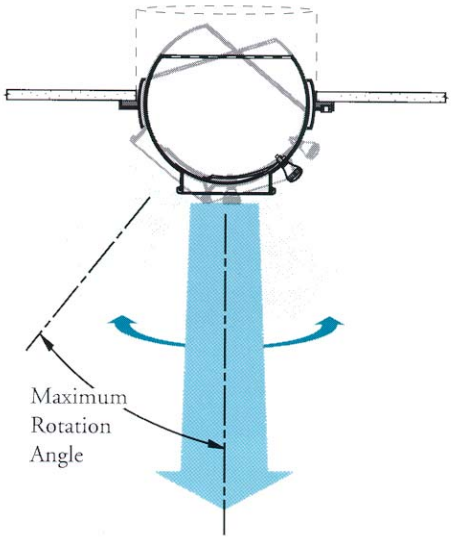
Many applications for Uni-Spot will be in areas with significant background noise. Therefore, it is not important to use the Sound Attenuator (other than to relieve bending stress at the takeoff). Unico recommends using aluminum supply tubing with a very short length of Sound Attenuator to prevent failure at the takeoff. Aluminum supply tubing is used as this has the added benefit of holding its shape when bent.

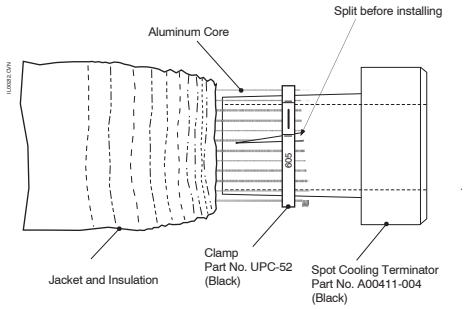
Using our aluminum supply tubing allows the person to reshape the duct so that it points in the direction required.



The plenum should be made of metal (minimum 26 ga) as it is sturdier and the takeoffs are much more secure. It is important, though, to seal the metal duct and to insulate the duct with at least 1.5 inches of blanket fiberglass or insulation sleeve. Also, be sure to use a foam saddle under the duct wherever it is supported by a strap. The plenum should be designed the same as the current Unico System layout (Bulletin 30-01).

Since sound levels are not a concern, only a short length of supply tubing is required. There is no requirement for an outlet other than for aesthetics. We have a special black outlet similar to our terminator that does not have a flange specifically for the Uni-Spot applications. We highly recommend its use as it makes the job much more professional looking.





Note — When connecting the supply tubing to the outlet, it is necessary to slit the tube end so it fits over the stub. Then use the clamp and seal the connection as you would for all outlets.

As an alternative, special nozzles such as the Seiho PK-4 "eyeball" can be mounted directly to the plenum. These nozzles are considerably more expensive than using a short length of aluminum tubing and require a closer mounted plenum but do have a more traditional "finished" look.

SIZING

The size of the system is based on the number of outlets. The system should be sized for 5 to 8 outlets per ton depending on the desired airflow. The number of outlets is dependent on three things:

Table 3. Recommended Number of Outlets

Application	Ambient Temperature, °F	Number of Outlets per worker
Warehouse, Assembly lines, Light Industry	85 – 95	1 – 2
Non-ventilated Warehouse, Hot factory	90 – 100	2 – 4
Dry Cleaners, Foundries, Welding areas	100 – 130	4 – 8

- The ambient temperature
- The return air temperature
- Personal comfort level

Uni-Spot is compatible with 100 percent outside air. Unico recommends using the lowest ambient temperature when cooling, whether it is inside or outside, for return. If there are contaminants present in the inside air, using 100 percent outside air is recommended. If the outside air temperature drops below 70°F, you can turn off the condensing unit for economy. For these lower outdoor tem-

peratures, we also recommend using a head pressure control on the condensing unit to reduce possible freeze-ups.

Table 3 lists recommended number of outlets for stationary workers depending on the application.

If 100 percent outside air of 95°F is pulled into the return, the discharge temperature will be approximately 65-70°F for refrigeration or chilled water systems. For chilled with water temperature between 40 and 45°F.

The air mixes rapidly so it is important to keep the duct discharge as close the person to be cooled as possible.