

THEATRICAL SMOKE, FOG, AND HAZE TESTING TIME AND DISTANCE GUIDELINES

In the absence of other information, theater-specific monitoring would be required to determine whether smoke/fog/haze machines are being used in accordance with the peak exposure guidelines. ENVIRON developed Time-and-Distance (T&D) Guidelines as an alternative to conducting theater- and production-specific monitoring. These T&D Guidelines were developed under conservative use assumptions (e.g., no on-stage activities or props that would enhance dispersion, cue release at breathing height level). By following these T&D Guidelines, a production can use fog effects without having to conduct its own stage-specific testing, provided the machines are used in accordance with manufacturer specifications, are well maintained, and are functioning properly.

The following tables describe the distance (with respect to the discharge point on the equipment) and length of time that concentrations exceeding the peak guidance levels would be expected to occur. Thus, by arranging the blocking and choreography such that an actor is not situated within the restricted areas during the times specified in these tables, actors should not receive exposures above the peak exposure guidelines.

It should be noted that these T&D Guidelines may not be appropriate for all productions. Productions may want to use different configurations for positioning the machines (e.g., different heights), provide enhanced on-stage ventilation, or generate fog for a longer or shorter period of time. In addition, many productions may have other stage-specific conditions (e.g., on-stage activities and props that enhance dispersion) that would allow actors to be present in areas that are restricted under these T&D Guidelines but which, in fact, do not exceed the guidance levels. In those cases, production-specific monitoring would be recommended to determine whether peak exposure may occur.

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CITC

TIME-AND-DISTANCE GUIDELINES			
Fantasy FX Professional Haze			
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (25 mg/m³)		
	Release Height	2 ft	6 ft
2	Breathing height	0	X
5		0	X
10		0	X
15		2	2
30		2	2

Note: X = not tested, but results are expected to be comparable to those at the 2 ft distance

Releasing the haze slightly above breathing height (e.g., simulating the spraying of hair spray above the head) did not result in any exceedances of the peak guidance level at the breathing height.

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Fantasy FX Professional Haze, prepared by ENVIRON International Corporation for Richard Frankel Productions, Inc., December 14, 2006.

HIGH END SYSTEMS (BARCO)

TIME-AND-DISTANCE GUIDELINES High End Systems F-100								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Atmosphere Cold Flow Formula	Full	15	70	30	30	30	30	30
	Medium	15	40	40	30	30	0	0
Atmosphere HQ Formula	Full	15	190	190	180	20	0	0
	Medium	15	170	80	70	0	0	0
Atmosphere Stage Formula	Full/Med	15	0	0	0	0	0	0

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

TIME-AND-DISTANCE GUIDELINES Barco/High End Systems FQ-100								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			6 ft	9 ft	12 ft	15 ft	18 ft	
Atmosphere HQ Formula	75	5	60	60	60	60	60	
	75	15	100	100	100	100	90	
	50	5	60	60	60	60	60	
	50	15	100	100	100	100	90	
	25	5	60	60	60	60	60	
	25	15	60	60	60	60	60	
	25	30	80	80	80	80	80	
Atmosphere Stage Formula	99	5	100	100	100	100	80	
	99	15	100	100	100	100	80	
	75	5	80	80	80	80	80	
	75	15	90	90	90	90	80	
	50	5	80	80	80	80	80	
	50	15	90	90	90	90	80	
	25	5	0	0	0	0	0	
	25	15	90	90	90	90	80	

Reference: Calibration Factors and Time-and-Distance Guidelines for the Use of Theatrical Fog Equipment, Barco FQ-100 with Atmospheres Stage Fluid and Barco FQ-100 with Atmospheres HQ Fluid, prepared by ENVIRON International Corporation for Barco Lighting Systems, December 2010.

LE MAITRE LTD.

TIME-AND-DISTANCE GUIDELINES							
Le Maitre Opti Mist Ranger with Mini Mist Canister							
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)						
	Machine Setting	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
15	Full	110	80	60	60	0	0
	Medium	110	80	60	60	0	0
Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u> , prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.							

LOOK SOLUTIONS

TIME-AND-DISTANCE GUIDELINES							
Look Solutions Cryo-Fog with Cryo-Fog Fluid							
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)						
	Machine Setting	3 ft	9 ft	15ft	21 ft	27ft	33 ft
30	99	0	0	0	0	0	0
60		0	0	0	0	0	0
180		0	0	0	0	0	0
300		0	0	0	0	0	0
30	75	0	0	0	0	0	0
60		0	0	0	0	0	0
180		0	0	0	0	0	0
300		0	0	0	0	0	0
30	30	0	0	0	0	0	0
60		0	0	0	0	0	0
180		0	0	0	0	0	0
300		0	0	0	0	0	0

References: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke
 Equipment: Look Solutions Low-Fogger, prepared by ENVIRON International Corporation for Look Solutions, August 2006.

Letter from Look Solutions to ENVIRON International Corporation regarding Tiny-Compact, Tiny F07, Tiny C07, and Cryo-Fog, January 24, 2007

LOOK SOLUTIONS

TIME-AND-DISTANCE GUIDELINES					
Look Solutions Power Tiny Fogger with Tiny-Fluid					
Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)				
	1 ft	3 ft	4 ft	6 ft	8 ft
15	0	0	0	0	0
30	55	55	55	20	15
60	60	60	60	50	20

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Look Solutions Power Tiny, prepared by ENVIRON International Corporation for Look Solutions, August 2006.

TIME-AND-DISTANCE GUIDELINES								
Look Solutions Tiny-Fogger/Tiny F07 and Tiny-Compact/Tiny C07 with Tiny-Fluid								
Release Duration (sec)	Time (in sec) After Which Concentrations Are Below Guidance Level (40 mg/m³)							
	1 ft	2 ft	3 ft	4 ft	5 ft	6 ft	7 ft	8 ft
5	33	33	10	0	0	0	0	0
15	33	33	23	7	0	0	0	0
30	57	57	57	57	20	20	20	0
60	67	67	57	57	20	20	20	0

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

Letter from Look Solutions to ENVIRON International Corporation regarding Tiny-Compact, Tiny F07, Tiny C07, and Cryo-Fog, January 24, 2007

LOOK SOLUTIONS

TIME-AND-DISTANCE GUIDELINES							
Look Solutions Viper NT with Quick-Fog Fluid							
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)						
	Machine Setting	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
5	99	15	15	15	15	15	15
15		30	30	30	30	30	28
30		30	30	30	30	30	28
45		30	30	30	30	30	28
5	75	5	5	5	0	0	0
15		10	10	10	10	5	0
30		25	25	25	25	25	25
60		40	40	40	40	40	15
120		40	40	40	40	40	15
180		40	40	40	40	40	15
5	50	0	0	0	0	0	0
15		0	0	0	0	0	0
30		20	20	20	15	0	0
60		20	20	20	20	0	0
180		20	20	20	20	0	0
30	25	0	0	0	0	0	0
60		20	20	0	0	0	0
180		20	20	0	0	0	0

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Look Solutions Viper NT, prepared by ENVIRON International Corporation for Look Solutions, August 2006.

MDG FOG GENERATORS, LTD.

TIME-AND-DISTANCE GUIDELINES						
MDG Atmosphere APS with Neutral Fluid						
Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (25 mg/m³)					
	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
40	190	190	120	0	0	0
Note: The MDG Atmosphere can be used in a "cycle cuing" mode, alternating between 40 seconds on and 100 seconds off at distances of 12 feet or further from the release point. Multiple machines can be run simultaneously provided they are at least 12 feet apart.						
Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u> , prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.						

TIME-AND-DISTANCE GUIDELINES						
MDG MAX 3000 APS with Neutral Fluid						
Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (25 mg/m³)					
	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
40	100	100	100	100	100	0
Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u> , prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.						

TIME-AND-DISTANCE GUIDELINES							
MDG Mini Max with Dense Fluid							
Release Duration (sec)	Machine Setting	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
		3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
15	Full	150	80	50	0	0	0
	Medium	130	40	40	0	0	0
Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u> , prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.							

REEL EFX, INC.

TIME-AND-DISTANCE GUIDELINES REEL EFX DF-50 with Diffusion Fluid						
Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (25 mg/m³)					
	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
40	0	0	0	0	0	0
<p>Note: The DF-50 can be used in a "cycle cuing" mode, alternating between 40 seconds on and 100 seconds off at all distances from the release point.</p> <p>Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u>, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.</p>						

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES								
Rosco Model 1500/1600								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Rosco Clear Fog Fluid	Full	15	230	150	60	0	0	0
	Medium	15	230	70	60	0	0	0
Rosco Fog Fluid	Full	15	170	100	80	40	40	40
	Medium	15	170	100	80	40	40	40
Rosco Light Fog Fluid	Full	15	150	70	70	70	60	50
	Medium	15	150	50	50	50	50	50
Rosco Stage & Studio Fluid	Full	15	80	80	50	40	40	40
	Medium	15	80	80	40	30	30	30

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES Rosco Model 1750									
Fluid	Machine Setting	Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m ³)						
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft	
Rosco Fog Fluid	100 %	5	45	45	30	10	0	0	
		15	45	45	45	45	35	20	
		30	50	45	45	45	40	30	
	60 %	5	60	60	60	0	0	0	
		15	60	60	60	50	10	0	
		30	70	70	70	70	10	0	
	30%	15	25	0	0	0	0	0	
		30	30	30	0	0	0	0	
		60	40	30	5	0	0	0	
		180	40	30	5	0	0	0	
	Rosco Stage & Studio Fluid	100%	15	25	25	20	15	0	0
			30	25	25	25	20	20	0
45			30	30	30	30	20	0	
60%		15	15	15	10	10	0	0	
		30	20	20	20	12	0	0	
		45	35	35	35	20	0	0	
30%		15	10	5	0	0	0	0	
		30	10	5	0	0	0	0	
		45	20	5	0	0	0	0	
Reference: <u>Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Rosco Model 1750</u> , prepared by ENVIRON International Corporation for Rosco Laboratories, August 2006.									

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES								
Rosco Alpha 900								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Rosco Fog Fluid	On	15	220	220	180	180	160	110
Rosco Stage & Studio Fluid	On	15	140	140	140	130	50	30
Reference: <u>Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze</u> , prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.								

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES								
Rosco Delta 3000 (100% and 50% Settings)								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			5 ft	10 ft	15 ft	20 ft	25 ft	30 ft
Rosco Clear Fog Fluid	100%	30	215	215	215	215	215	115
	50%	30	88	88	88	88	88	70
Rosco Fog Fluid	100%	30	157	157	157	87	87	87
	50%	30	94	94	94	57	56	44
Rosco Light Fog Fluid	100%	30	63	63	63	53	53	53
	50%	30	60	10	0	0	0	0
Rosco Stage & Studio Fluid	100%	30	53	53	53	53	53	53
	50%	30	50	33	33	28	28	23

Reference: Development of Time-and-Distance Guidelines For Use Of Theatrical Smoke Equipment: Rosco Delta 3000, prepared by ENVIRON International Corporation for Rosco Laboratories, May 2004

TIME-AND-DISTANCE GUIDELINES								
Rosco Delta 3000 (10% Setting)								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	18 ft	
Rosco Clear Fog Fluid	10%	60	130	130	130	130	73	
Rosco Fog Fluid	10%	60	58	0	58	58	0	
Rosco Light Fog Fluid	10%	60	30	0	0	0	0	
Rosco Stage & Studio Fluid	10%	60	63	13	13	13	0	

Reference: Development of Time-and-Distance Guidelines For Use Of Theatrical Smoke Equipment: Rosco Delta 3000, prepared by ENVIRON International Corporation for Rosco Laboratories, May 2004

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES Rosco Delta Hazer with Delta Hazer Fluid							
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m ³)						
	Machine Setting	3 ft	6 ft	12 ft	15 ft	21 ft	27 ft
30	100	0	0	0	0	0	0
60		0	0	0	0	0	0
300		0	0	0	0	0	0
600		0	0	0	0	0	0
30	50	0	0	0	0	0	0
60		0	0	0	0	0	0
300		0	0	0	0	0	0
600		X	X	X	X	X	X
60	30	0	0	0	0	0	0
300		X	X	X	X	X	X
600		X	X	X	X	X	X

Note: X = not tested, but results are expected to be comparable to those at the 100% machine setting.

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke
 Equipment: Rosco Delta Hazer, prepared by ENVIRON International Corporation for Rosco Laboratories, August 2006

ROSCO LABORATORIES

TIME-AND-DISTANCE GUIDELINES								
Rosco PF-1000								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Rosco Fog Fluid	Full	15	60	40	0	0	0	0
	Medium	15	60	0	0	0	0	0
Rosco Stage & Studio Fluid	Full	15	100	70	60	60	0	0
	Medium	15	100	70	0	0	0	0

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

ULTRATEC SPECIAL EFFECTS

TIME-AND-DISTANCE GUIDELINES								
Ultratec Special Effects G100								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Extra Quick Dissipating Fluid	On	15	100	40	40	40	30	30
Quick Dissipating Fluid	On	15	150	150	40	40	30	30
Director's Choice Fluid	On	15	150	30	30	0	0	0

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

TIME-AND-DISTANCE GUIDELINES								
Ultratec Special Effects G150								
Fluid	Machine Setting	Release Duration (sec)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
			3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
Extra Quick Dissipating Fluid	Full	15	50	40	40	30	30	30
	Medium	15	50	0	0	0	0	0
Molecular Fog Fluid	Full	15	90	50	40	0	0	0
	Medium	15	90	0	0	0	0	0
Quick Dissipating Fluid	Full	15	60	60	40	0	0	0
	Medium	15	60	0	0	0	0	0
Director's Choice Fluid	Full	15	110	80	70	70	0	0
	Medium	15	60	50	50	0	0	0

Reference: Equipment-Based Guidelines for the Use of Theatrical Smoke and Haze, prepared by ENVIRON International Corporation for the Equity-League Pension and Health Trust Funds, June 8, 2001.

ULTRATEC SPECIAL EFFECTS

TIME-AND-DISTANCE GUIDELINES						
Ultratec Special Effects LSG MKII-PFi9D with Molecular Fog Fluid						
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (40 mg/m³)					
	Machine Setting	3 ft	6 ft	12ft	18 ft	30 ft
30	100	0	0	0	0	0
60		0	0	0	0	0
120		0	0	0	0	0
300		0	0	0	0	0
30	50	0	0	0	0	0
60		0	0	0	0	0
120		0	0	0	0	0
300		X	X	X	X	X
30	10	0	0	0	0	0
60		0	0	0	0	0
120		0	0	0	0	0
300		X	X	X	X	X

Note: X = not tested, but results are expected to be comparable to those at the 100% machine setting

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Le Maitre LSG-MKII with Power Fog Industrial 9D (PFi9D) Low Smoke Generator, prepared by ENVIRON International Corporation for Le Maitre Special Effects, August 2006.

ULTRATEC SPECIAL EFFECTS

TIME-AND-DISTANCE GUIDELINES							
Ultratec Special Effects Radiance Hazer with Neutron/Luminous 7 Haze Fluid							
Release Duration (secs)	Time (in sec) After Which Air Concentrations Are Below Guidance Level (50 mg/m ³)						
	Fan speed /Haze output	3 ft	6 ft	9 ft	12 ft	15 ft	18 ft
30	100/100	5	5	5	5	0	0
60		10	10	10	10	10	0
180		10	10	10	10	10	0
300		10	10	10	10	10	0
180	50/100	0	0	0	0	0	0
300		X	X	X	X	X	X

Note: X = not tested, but results are expected to be comparable to those at the 180 second duration.

Reference: Development of Time-And-Distance Guidelines for Use of Theatrical Smoke Equipment: Le Maitre Radiance Hazer, prepared by ENVIRON International Corporation for Le Maitre Special Effects, August 2006.