MSA V-Gard® Reflective-Coated Visors:
Radiant Heat Resistance Simplified

MSA
The Safety Company

Introduction

Controlling body temperature through workload and environmental management is critical to help prevent heat-related illness and injury. Workers in foundries, steel mills, smelters, and other elevated temperature working environments are particularly vulnerable to heat stress due to frequent exposure to thermal radiation and resulting electromagnetic radiation (EMR). Reflective-coated visors not only help distort heat, but can also help to prevent skin and eyes from absorbing EMR, including infrared (IR) and ultraviolet (UV) radiation.

Misinformation exists in the marketplace regarding reflective-coated visor performance against heat, IR and UV. As result, MSA Chemical Research and Materials Science evaluated the performance of MSA V-Gard Reflective-Coated Visors. Those evaluations determined the amount of heat in front of visors versus what eyes/face experience behind it, as well as the measurement of irradiance[1] at the eye.

The findings show that V-Gard Reflective-Coated Visors distort a significant amount of heat. During evaluations, temperature in front of the visor reached 414°F, but behind it (near the eyes) reached ~104°F[2] (*see Figure 1*). V-Gard Reflective-Coated Visors reflect 99%+ of irradiance, allowing <1% to pass through[2]. This finding is significant because for environments >95°F, ocular irradiance levels should not exceed 0.1 kW/m^2 (for lengthy exposures, >1000 seconds).[3] (*See "Important Findings" for additional information.*)

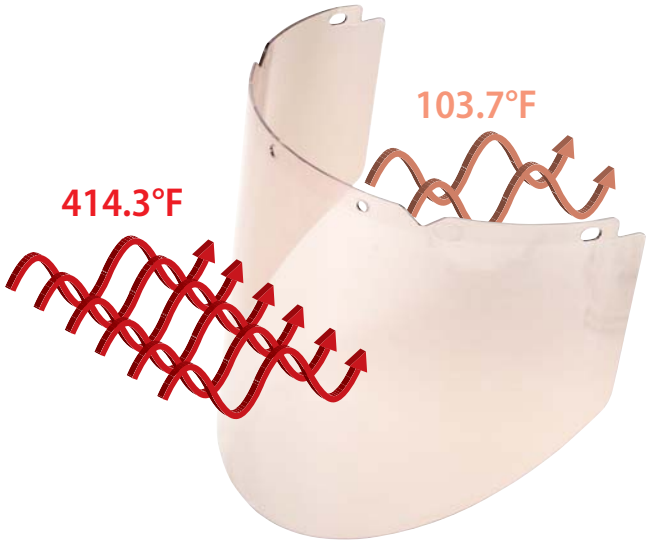

Figure 1: *V-Gard Reflective-Coated Visor surfaces were exposed to irradiance of 9.5kW/m^2. For comparative purposes, firefighters are typically exposed to radiant heat fluxes between 5-10 kW/m^2 during a fire.[4]*

[1] *EMR rate of transfer across a surface.*
[2] *When subjected to irradiance on the visor surface as indicated (either 15 kW/m-2 or 9.5 kW/m-2) by placing it 7" or 9.5" respectively, from heat source of 1460˚F for five minutes.*
[3] *From Internal Commission on Non-3Ionizing Radiation Protection, "Guidelines on Limits of Exposure to Incoherent Broadband Optical Radiation," 1987. The Commission also indicates that higher irradiance levels could be sustained for shorter periods.*
[4] *V-Gard Reflective-Coated Visors are not intended for firefighting and should not be used for that purpose.*

Important Findings

V-Gard Reflective-Coated Visors reduce the temperature on the outside of visors versus that measured at the nose and eyes, and they significantly reduce irradiance. However, these important caveats should be considered:

1. While these visors withstood temperatures much higher than 400°F, the temperature experienced by workers under visors would likely exceed common industry understanding of "safe levels[5]." In other words, although the visor itself may not be adversely affected, the worker wearing it could be.
2. Most assemblies (helmet and frames) to which these visors attach should not be worn within radiant heat environments exceeding 275°F–350°F (depending upon the MSA helmet to which they attach). While a helmet can be altered by the wearer to help prevent damage, neither helmet nor frame is performance-tested to temperatures beyond those stated by MSA.
3. V-Gard Reflective-Coated Visors help to prevent a significant amount of irradiance from reaching areas under visors, such as eyes and face, under the conditions stated. However, these conditions may not be the same as those in working environments. That is why it is important to select the proper visor for the temperature, distance and duration of/from an EMR source.
4. EMR consists of UV and IR; these hazards should be carefully considered when selecting Personal Protective Equipment (PPE). Visors tested and marked for proper protection levels against such hazards should be chosen.
5. Reflective-coated visors should not only be able to distort heat, but they should also reflect IR and filter UV. ANSI/ISEA Z87.1-2010 (the "Standard") does not provide requirements for either heat resistance or IR reflectance; so claims that visors perform against heat or reflect IR cannot be substantiated through the Standard.

ADDITIONAL BENEFITS OF V-GARD REFLECTIVE-COATED VISORS

Many hazards that workers face within radiant heat conditions are addressed by V-Gard Reflective-Coated Visors that offer:

- ***Maximum UV ("U6") protection as tested under the Standard; important because not all polycarbonate blocks UV that is is present as a result of EMR.***
- ***An EN166 'R' mark, signifying that the mean spectral reflectance of IR between 780nm and 2000nm is >60%, helping to protect skin and eyes from IR exposure.***
- ***Impact protection (Z87+).***
- ***Clear or tinted options for dark vs. glare-riddled environments.***

Conclusion

PPE such as reflective-coated visors, are one of several engineering controls used to reduce physical demands of heat where workers are concerned. If product markings are not readily available, test data should be secured to help ensure that claims have been substantiated. When inaccurate information concerning reflective-coated visor performance (including heat protection levels) exists in the marketplace, misconceptions could arise regarding the role that these visors play in preventive safety easures—potentially proving hazardous to workers.

For detailed information concerning Radiant Heat Resistance and V-Gard Visors, see Bulletin #0670-020-MC/Aug 2013.

For questions, please contact MSA Customer Service at 1-800-MSA-2222 or visit us at MSAsafety.com, keyword: VGARDSYSTEM.

[5] *When skin temperature skin reaches 113°F, humans feel pain and tissue damage occurs. Nachum Dafny, Ph.D., Department of Neurobiology and Anatomy, The UT Medical School at Houston (http://neuroscience.uth.tmc.edu/s2/chapter06.html).*

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