Frequently Asked Questions about Crystalline Silica Testing and the Silica Testing Task Force (STTF) Report

1. What is crystalline silica?

   Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. Cristobalite and tridymite are two other forms of crystalline silica. All three forms may become respirable size particles when workers such as miners chip, cut, drill, or grind objects that contain crystalline silica.

2. Why are people concerned about possible crystalline silica emissions from Intel?

   The local concern is that the volatile organic compound named HMDS, a silicon-based compound used in the semiconductor industry, could be transformed to respirable-size particles of crystalline silica when HMDS is treated in the Recuperative Thermal Oxidizers. Fine Crystalline silica dust has been associated with lung disease. HMDS evaporates into the plant's exhaust and exits through the thermal oxidizers, where it is burned and oxidizes into silicon dioxide, which is silica.

3. What chemical releases from Intel may be causing serious illnesses in Corrales?

   The CEWG arranged to do independent testing of current releases of crystalline silica from Intel's stacks. The reason for the testing was public concern that crystalline silica was causing illness and the ATSDR's analysis of health risks recommended getting more data on crystalline silica emissions. The test results show conclusively that these current emissions are far too low to cause illness. The testing says nothing about releases of chemicals other than silica and crystalline silica.

   The Agency for Toxic Substances and Disease Registry (ATSDR) currently is reviewing the STTF report with this finding. The ATSDR has a national charter and has the most resources of expertise and funding to deal with this FAQ in its entirety. The ATSDR has worked on the relationship of chemical releases to illness in Corrales since 2005 and reported initial findings in 2009. The FAQ will be forwarded again to the ATSDR to consider as they review the STTF report. For information about the ATSDR, go to www.atsdr.cdc.gov.

4. What is the Citizen Protocol and how was it used?

   The Citizen Protocol is a process developed by the CEWG to get test data that everyone can trust. The details are on the CEWG website, but the essence of the process is to do testing at arm's length from Intel by establishing a community-based

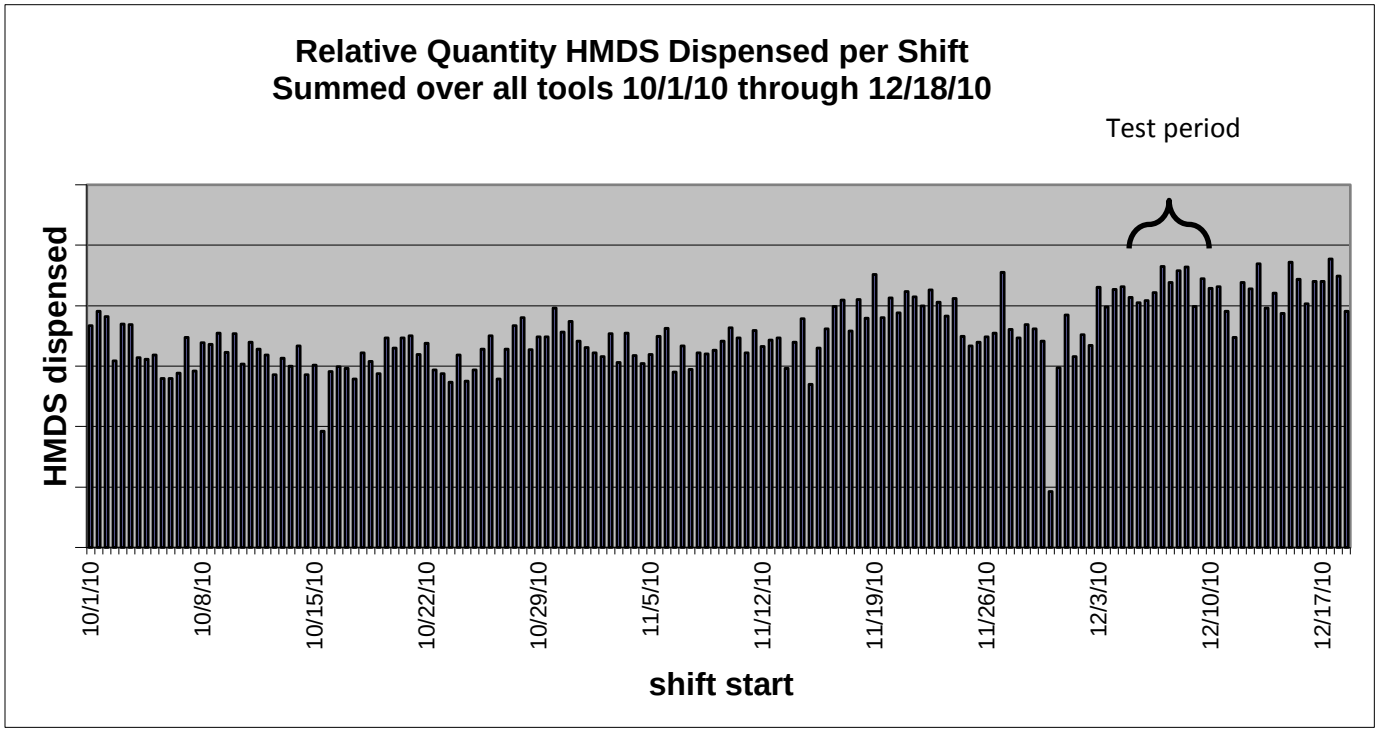
task force and other means. The entire Protocol would take an enormous amount of time to implement, and because of this, only a modified version of the Protocol was used. The primary time constraint was the fact that older Durr units would be going offline at the end of 2010, and the group wanted data from these as well as newer Munters units. The testing was managed by a community-based group that included two members of the Corrales Village Council, CEWG members, a representative of Intel, and one other Corrales resident.

5. How was the study funded?

   Intel funded the study. Although the Citizen Protocol discourages use of Intel funds, it allows Intel to fund testing if other forms of funding cannot be found. The CEWG made a concerted effort to find other sources of funding for a silica test through the Citizen Protocol, but failed to do so.

6. How can someone tell if the factory conditions were consistent during testing?

   Appendix G of the STTF report has a graph showing Intel HMDS usage and production before, during and after testing.



7. At what temperature does crystalline silica form and at what temperatures do Intel's oxidizers operate?

   The answer to the question at what temperature does crystalline silica form is not simple because it depends upon conditions, such as purity of the silicon dioxide and the time and temperature history of the material. The phase diagram of silicon dioxide indicates that a transition from the amorphous non-crystalline form to the crystalline forms known as trydimite and crystobalite takes place at temperatures above 2000 deg F when silica is in a pure state (*Precipitated silicas and silica gels with and free of deposited carbon from caustic biomass ash solutions and processes*; Stephens, et al, US Patent 6,375,735 B1 April 23, 2002). However, data from the incineration of biogenic materials suggest that crystalline silica can form as early as 1150 F when heating rice husks (Direct Pyrolysis of Raw Rice Husks for Maximization of Silicon Carbide Whisker Formation, {Raghavarapu Venkata et al, Journal of American Ceramic Society, V.74, Issue 11, p 2869-2875}). Crystalline silica can form from amorphous silica at extreme temperatures with slow cooling times, according to the National Institute of Occupational Safety and Health (2003). This transformation will not occur at temperatures below 800 C (or 1472 F). Intel's newest oxidizers are required to operate at an hourly-average temperature of 1385 F.

8. Did HMDS get used during the testing period? Did Intel vary its usage so that it could not be detected?

   The HMDS usage was tracked and is presented in Appendix G of the report. The actual volumes used are not for publication but the relative amounts used per 12 hour shift are shown in a graph in Appendix G. The data reveal that the HMDS usage was typical for the prior week of production and Intel did not vary its usage or production during the testing.

   The normal usage of HMDS during the test period is confirmed further in a second way. NIOSH weighed and reported particulate matter on each pre-weighed fiberglass filter. The major source of particulate matter measured on the filters is from the HMDS used during the test in the chip making process.

9. Did the temperature vary during the testing? Did Intel turn the temperature down during the testing?

   The temperature recorded during testing is presented in Appendix F-3 of the report. Intel did not turn the temperature down and is required by the air permit to maintain hourly average temperatures for each unit.

10. Did witnesses see the equipment running and did they verify that the equipment was running while they were onsite?

    Yes community members observed, checked and verified that equipment was running. They were able to verify both from witnessing actual fans spinning, valves in the appropriate position, and the actual burners firing. In addition, witnesses observed the actual operating temperatures.

11. How does the chain of custody work? What was the process the group followed?

    The chain of custody documentation was followed exactly as prescribed in any sampling effort. EPA cites the chain of custody (COC) is a legal term that refers to the ability to guarantee the identity and integrity of the sample (or data) from collection through reporting of the test results (www.epa.gov).

    An identifiable person must always have the physical custody of a piece of evidence. In our case the consultant ERM signed the COC and sealed the document with the fungible goods (stack samples) and placed them in a sealed cooler for transport. Witnesses were present for all of this procedure and witnessed the handoff of the goods to the transportation agency (FedEx). These transactions, and every succeeding transaction between the collection of the evidence and its analysis was completely documented in chronological order to withstand legal challenges to the authenticity of the evidence.

    To further the accuracy of the chain of custody, community witnesses (Appendix A) witnessed the process of collecting the entire contents of the sample and potential sample left in the tube onto the NIOSH pre-weighed filter, NIOSH numbered filters and their respective holders. Each sample was sealed in a NIOSH-provided container and labeled with a label provided by NIOSH. These elements of the labeling and chain-of-custody witnessing and documentation ensured there was no tampering with the samples post sample collection. Witnesses were asked if they had any issue with the procedures and each witness was given the opportunity to provide input real-time to the procedure as well as all subsequent meetings. No issues were raised or details provided regarding any suspected issues by any of the witnesses at any time during the process or after the process despite repeated requests. The witnesses elected not to take custody of the samples; therefore, the sampling agency (ERM) was always present with the samples even if the witnesses chose not to be present.

12. How were emissions of crystalline silica measured in the silica testing project?

    The entire crystalline silica sample collection and measurement was specially designed with the help from NIOSH. The collection and analysis focused on accurately measuring the presence of crystalline silica. The sampling apparatus was

specially designed to measure crystalline silica. Amorphous could not be accurately measured since amorphous silica is the chief component of the fiberglass filters that had to be used to capture the particulate matter including crystalline silica. Dr. Rosa Key-Schwartz, the NIOSH expert on silica, selected, tested and approved the Teflon-coated fiberglass filters. These filters were selected because they can withstand the extra high temperatures in the RTO stacks. Each of the 20 fiberglass filters used to collect stack samples was numbered and weighed by NIOSH before NIOSH shipped the filters to the Rio Rancho site. The five filters used to collect samples each day from the five Intel RTO stacks were returned to NIOSH the same day. NIOSH weighed each numbered filter after its use, and that revealed to NIOSH the weight of particulate matter collected on each filter.

Sample duration necessary to capture an amount necessary for detection was calculated based on theoretical conversion of HMDS to crystalline silica. The duration was expanded to go 80 times the necessary duration to ensure there was sufficient time to capture any potential crystalline silica.

X-ray diffraction told NIOSH how much crystalline silica, if any, was on each filter. The weight of particulate matter told NIOSH how much total particulate (namely amorphous plus crystalline silica if any with minor amounts of particles attributed to the combustion of natural gas) was on each filter. Although the amount of amorphous silica caught on each filter is not accurately known, it can be assumed to be all of the particulate to create a "worst case scenario". The ATSDR peer review panel will review the validity of these details in the STTF report.

13. How were emissions of amorphous silica measured in the silica testing project?

While no direct measurements of amorphous silica were taken, the sampling apparatus was specially designed NIOSH for collecting and measuring the presence of crystalline silica and total particulates. The test could not accommodate the direct or indirect measurement of amorphous silica because the filters used for capturing the particulates in this high temperature environment are made of fiberglass and amorphous silica is the chief component of fiberglass.

Since amorphous silica is the chief component of fiberglass that had to be used as a filter material. Dr. Rosa Key-Schwartz, the NIOSH expert on silica, selected, tested and approved the Teflon-coated fiberglass filters to withstand the extra high temperatures in the RTO stacks. Each of the 20 fiberglass filters used to collect stack samples was numbered and weighed by NIOSH before NIOSH shipped the filters to the Rio Rancho site. The five filters used to collect samples each day from the five Intel RTO stacks were returned to NIOSH the same day. NIOSH weighed each

numbered filter after its use, which told NIOSH the weight of particulate matter collected on each filter.

X-ray diffraction told NIOSH how much crystalline silica, if any, was on each filter. The weight of particulate matter told NIOSH how much total silica (amorphous plus crystalline) was on each filter. Any source of particulate matter in the RTO stacks is very small compared with silica. Thus, the amount of amorphous silica caught on each filter is well known and substantial in amount, according to NIOSH. The ATSDR peer review panel will review the validity of these details in the STTF report.

In this study all particulate matter can be assumed to be amorphous silica for the purpose of modeling. Amorphous silica is not a known carcinogen but if the same model used for crystalline silica was applied to the total particulate values captured on each filter, the data reveal that the concentrations of amorphous silica at the fenceline are below the provisional level assigned by the community for crystalline silica. A natural conclusion is that the concentrations of gross particulate matter (primarily amorphous or crystalline silica) is below known or perceived health risks.

14. This study only discusses present-day emissions? Using these data what were the emissions back when some community members worried that Intel was pouring crystalline silica into the air?

    The Task Force openly discussed and made a decision not to make correlations of the present-day data to what transpired in the past. The data from previous emissions and silica tests exist and can be used for future discussions if the surrounding community finds value in performing the historical correlation. The previous data are on the CEWG website.

15. Were the operating conditions (production, temperatures and HMDS usage) constant prior to and during the testing?

    Yes – Appendix G also shows a graphical representation of production before, during and after testing.

16. Has this report been reviewed by scientists other than Intel's staff?

    Intel did not write the report. In fact Intel was not given the report or the analytical results until the community consultant had reviewed, interpreted and made final calculations with the data. The report is currently being reviewed by a peer group selected by ATSDR (per Peter Kowalski). They have not provided a date by which the report review will be complete.

17. How was the crystalline silica test performed?

The principal elements were planned by the Silica Testing Task Force. The first step was to plan what was to be done, how the results would be used, and how the report would be constructed. The basic elements included:

- Collected a large sample of particulate matter from each of the RTO stacks with stack sampling performed by ERM;
- ERM shipped the filters containing the collected particulate matter to Dr. Rosa Key-Schwartz with NIOSH;
- Dr. Key-Schwartz provided a contractor with the samples which were weighed and analyzed by x-ray diffraction,
- Dr. Key-Schwartz sent descriptions of the measured amounts of crystalline silica and the weights of particulate matter to STTF chairman, Jim Tritten;
- Kurt Parker of ERM sent a report describing the amount of exhaust gas passing through filter and the conditions under which the samples were collected to Mike Williams and Jim Tritten;
- Jim Tritten sent the lab results describing the amounts of crystalline silica and particulate weights to Mike Williams and ERM task leader, Kurt Parker;
- Mike Williams wrote a report describing the implications of the sampling and analyses for average community concentrations of crystalline silica and compared the results with the CEWG crystalline silica provisional level;
- simultaneously Kurt Parker of ERM incorporated some of the information from the lab analyses into a revised report on the sampling;
- Jim Tritten merged the two reports into a single report to describe the measurement program and its results;
- Jim Tritten distributed the draft report to the STTF.

18. What are the qualifications of the individual(s) that made the calculations for the purpose of the report?

A summary of the membership of the Silica testing task Force is provided in Appendix B. The key person that performed the calculations was Mike Williams, the community appointed consultant. Mike Williams has BS, MS, and Ph.D degrees from UCLA in engineering. He has approximately 35 years of experience in air quality modeling and measurements.

19. What is ERM and what did ERM do in the crystalline silica testing project?

ERM (Environmental Resources Management) is an international consulting firm that provides environmental services. ERM started work with Intel in 2002 on the risk assessment which was complete in 2005. ERM did not perform any stack sampling at that time. ERM started sampling, testing and analysis of Intel's air emissions in 2007, to comply with state and federal regulatory requirements. State and federal

regulations require air sampling and testing to be done by government certified contractors using EPA specified methods. ERM provided the certified equipment and personnel that collected samples of particulates from five Intel stacks simultaneously, as watched by citizen volunteer witnesses. The high stack temperatures required the use of some methods that were specially developed and approved by the federal agency, National Institute of Occupational Safety and Health (NIOSH), and their expert on crystalline silica, Rosa Key-Schwartz. ERM provided the sampling report before the test results were available to anyone. The sampling report and the test results reported by NIOSH are the two pieces from which the STTF report was written by Mike Williams of the CEWG.

20. Will there be more silica testing?

    The CEWG is currently weighing whether these data compel them to move forward with another round of testing to prove or disprove that the modeled concentrations are 55,000 times below the provisional level. Or is the best use of time and resources to move on and push for other environmental improvements and other emissions testing at Intel's New Mexico facility.

21. Will there be more testing of other chemicals from Intel's air emissions?

    The CEWG is likely to request additional chemical testing in the future pending their decision regarding additional silica testing

22. Since the usage of HMDS is very low or nearly zero, why did you bother testing for crystalline silica?

    The HMDS usage has been declining since 1994. This was publicly documented in CEWG meetings and was quantified on the web site in July of 2009. See http://www.intel.com/Assets/PDF/General/Community-NM-HMDS.pdf. Despite these public data and the crystalline silica testing previously conducted by Intel, demands from the concerned public to do more crystalline silica testing have continued. Also, the ATSDR in its draft report recommended that additional silica testing be done.

23. How could Intel vary their monthly use of HDMS, which has ranged from zero to 538 pounds over a year?

    Although this question is not addressed by the report, Intel's usage that is recorded in their public reports is based upon purchases per month (for permit required reporting, purchase is equal to usage to demonstrate compliance to a rolling annual limit). Therefore, when the factory does not have demand for their product, the production

goes down. If they did not use the entire amount from the previous purchase (amount) they may not need to purchase a particular chemical. The chemical usage will vary, especially as production varies.