

**Dr. Allaei's Rebuttal to
Kraemer Written Rebuttal Dated December 10, 2009**

This report is prepared for

Town of Osceola, Polk County, WI
516 East Avenue North, Dresser, WI 54009-0216

QRDC Project Tracking Number: **Q091001120-Osceola**
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Introduction

The Town of Osceola has hired Dr. Daryoush Allaei, PE, to review and prepare a rebuttal to the recent written rebuttal by Kraemer dated December 10, 2009. The consultant, Dr. Allaei, PE, reviewed the documents that had relevance to noise and vibration issues that could be caused by the proposed mining operation and blasts.

This report delivery concludes the entire work for this project. The consultant will be glad to attend the Town or County's public hearing if so needed.

1. Qualifications:

1.1 The qualification of Dr. David Braslau (Kraemer Consultant):

The following was copied from Dr. Braslau's web site. "*Dr. David Braslau, founder and firm president, received his Bachelor of Science Degree from the Massachusetts Institute of Technology in 1956, and his Master of Science and Doctor of Philosophy Degrees from the University of California at Berkeley in 1960 and 1966, respectively. He taught at the University of Minnesota from 1966 until 1971, when he founded the firm of David Braslau Associates. Dr. Braslau is a Registered Professional Engineer in the state of Minnesota. Society memberships include the Acoustical Society of America and the Institute for Noise Control Engineering.*"

1.2 The Qualification of Dr. Daryoush Allaei, PE (Town Consultant):

The following was copied from QRDC web site. "**Daryoush Allaei** brings over 25 years of research and development and business experience to QRDC. Dr. Allaei has provided the technical innovation and business leadership through fifteen years of funded research and development that led to several technological and product breakthroughs. He received his Ph.D., MSME and BSME degrees from Purdue University in the field of mechanics with his doctoral emphasis on Systems Dynamics and Structural Dynamics. His technical expertise is in dynamics systems with emphasis on vibration, shock, acoustic and noise control. He was a professor or adjunct professor at the University of Mississippi, Mankato State University, and Iowa State University. Dr. Allaei is a leader in the study and application of smart structures and vibration control. He is the inventor of the Vibration Control by Confinement and Energy Flow Control concepts, which address vibration and noise control problems in a very favorable performance to cost ratio. His accomplishments in this field include over 85 national and international publications, numerous speaker invitations at conferences and workshops, Chair or Vice Chair positions at several conference sessions, nine USA patents with internationals pending and several pending or in-preparation patents, and over 10 technology awards and grants totaling about \$8,000,000 from the U.S. government. Dr. Allaei is a member of the American Society of Mechanical Engineers (ASME), American Institute of Aeronautics & Astronautics (AIAA), Society of Manufacturing Engineers (SME) and Society of Automotive Engineers (SAE). Dr. Allaei is a registered Professional Engineer and Certified Manufacturing Engineer."

1.3 Comparison of the Qualifications:

As it is stated above, Dr. Braslau has no formal training in system dynamics, structure dynamics, and noise and vibration control. In fact his degrees are in science and Civil Engineering. The most important qualification that he lacks is structural dynamics. Therefore he may not have the required depth in the area of structural dynamics in order to express an expert opinion on the influence on blast (or ground vibration) on buildings and structures. As it is reported in multiple documents, he relies on work by others.

On the other hand, Dr. Allaei has 3 degrees (Ph.D., MSME, and BSME) in Mechanical Engineering from Purdue University. He is specialist in system and structural dynamics with emphasis on vibration and noise/acoustics generated by structural vibrations. Based on his national awards from US Military, Department of Energy, business community, and scientific community, and his list of publications (over 85 national and international articles),

he is considered an expert in structural dynamics and vibrations. He has been a professional Engineer (PE) licensed to work in MN since 1991.

- 1.4 Dr. Braslau received his Civil Engineering degree in 1956; this is the year Dr. Allaei was born. In those years, civil engineers had very little or no understanding of how dynamic events (such as wind, road traffic, railroad dynamics, or structural resonances) could result in catastrophic and often fatal failures. In fact, the history is full of unexpected failures of buildings and bridges due to the building codes used during the decade when Dr. Braslau graduated. Since 1956 numerous advancements have been made in the field of engineering. In particular, the field of structural dynamics has been noticeable advanced and has made its way in civil engineering in early to mid 70s. The phenomenon of building and bridge resonances has made its way in main stream civil engineering practice by mid 70s. It is not clear when was the last time Dr. Braslau has had a peer reviewed publication in the area of noise, vibration or structural dynamics. I could not find any in recent years.

In contrast, Dr. Allaei received his Ph.D. in the area of structural dynamics from Purdue University in 1986. Since his project at Purdue University, all his work has been focused on structural dynamics, from automotive tires to large defense vehicles such as submarine, helicopter, or aircraft, to buildings such as clean rooms, mining facilities and equipment, and hospitals. He has published over 85 articles on the subject of noise/vibration and structural dynamics in national and international journals and conferences in the period from 1983 to 2009. Most of Dr. Allaei's work has been subjected to multiple peer review before acceptance for publication.

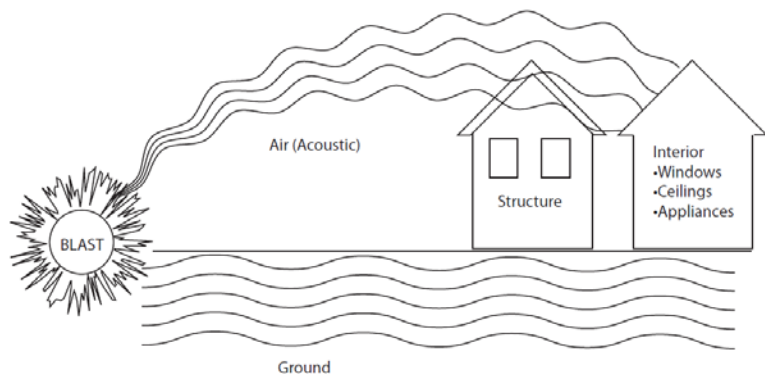
2. It is noted that in the Kraemer rebuttal, their consultant is referred to by his title and credentials, such as Dr. Braslau (PE). However, in most places they refer to the Town's consultant as "QRDC". The conveniently neglect to mention that the Town's consultant was Dr. Allaei (PE). Two questions the committee should ask are: Why has the Kraemer done its best to intentionally hide or downplay Dr. Allaei's credentials. Why does Kraemer insist to refer to their consultant as Dr. Braslau (PE) even though he has no qualification in structural dynamics? Having a Ph.D. degree does not qualify one in expressing expert opinion in a very complicated subject such as structural dynamics, ground vibrations, and dynamic blast energy. Even though it is claimed that he has been involved in similar projects, it is not clear what his involvement entailed.
3. Dr. Braslau's statement that the proposed blasting will be safe for all structures and there will be no issues for health, safety, and welfare is not accurate and misleading. First, his qualification and formal education and training in the area of structural dynamics are minimum or nonexistent. Second, Dr. Braslau's statements about the relationship between rattling and structural integrity and safety have no engineering basis and are totally misleading. He has stated that *"There is no basis (or the assumption that rattling is likely to routinely occur with quarry blasting. Blasting from the site will meet all applicable standards for health, safety, and welfare and will not cause damage to adjacent structures. If a rattle occasionally occurs it will not cause structural damage as the comment above suggests. Based upon information from the Ohio Department of Natural Resources, rattle is associated with non-structural items such as ceilings; windows; office equipment; computers; items sitting on shelves, heating and ventilating ducts, and light fixtures that have nothing to do with the safety and integrity of the building. Even if rattling does occur, there is absolutely*

no correlation between how a blast "feels" and it's potential for causing structural damage to a home. In fact, structural stresses (e.g., doors slamming, kids jumping, people ascending or descending stairs) and natural stresses (e.g., sunlight, wind, rain, temperature and humidity fluctuations and changes in soil moisture) place greater stresses on a home than legal air blast and vibration levels."

There are several problems with the above statements. Before I point the issues with his general statements, let me explain how dynamic energy propagates from a source (i.e. a blast) to a receiver (i.e. house or building). A blast generates an impulsive energy that propagates through earth or any other connected structure that resists its propagation. It is called impulsive because it has a massive amount of energy focused in a short period of time. Ground motion due to a blast is very similar to earthquake; short time but massive amount of energy. It is this focused energy that is damaging to buildings and houses. Furthermore, because blast energy is impulsive, it contains a broad range of frequencies. The frequency content depends on how short the blast is in time. If any of the frequencies contained in blast energy match the resonances of structure or part of the earth on its path or if any of the frequencies contained in blast energy match the resonances of a building, its damaging impact will be magnified. So the use of a word such as "absolutely" in part of his statement "*there is absolutely no correlation between how a blast "feels" and it's potential for causing structural damage to a home*" cannot be any further from reality. In fact, today's engineers (I am not sure those who graduated in 1956) have been trained to avoid the use of words such as "absolute" since it does not exist in real life. However, science majors (such as mathematicians) are in the habit of using extreme words such as absolute.

The chance that none of the frequencies in blast energy match one or more of the structural resonances is unlikely. The chance that no part of the blast energy reaches one or more of the houses within the vicinity of the blast radius is also unlikely. Recall that structural resonances amplify motion and often cause gradual damage or catastrophic structural failures that could be fatal to the occupancies of a building. Structural failures due to resonances have been observed throughout the history in bridges and building.

Next, let me explain how rattling is related to the vibration of the main structure of a house or building. Dr. Braslau claims that rattling has no relation to potential structural shaking or vibrations due to blast is false and comes from lack of expertise in structural dynamics. Let's consider what Dr. Braslau pointed out as rattling in non-structural members such as ceilings; windows; office equipment; computers; or items sitting on shelves. The question to ask is how do windows or shelves vibrate or rattle? For example, windows don't shake without injecting dynamic energy in them; windows must receive energy from a source. Windows or shelves are supported by walls or counter tops that are supported by other walls or floors that in turn are supported by the building super structure.



Unless there is dynamic energy in the building structures, there is no way that windows or shelves can rattle (or vibrate). In fact, in the absence of acoustic (airborne) or other non-blast energy, windows vibrate (or rattle) because dynamic energy (such as that from a blast) can reach window frames through building super structure. Of course dynamic energy can also be reached windows or shelves acoustically. In fact, as it is known, blast energy propagates through earth motion and air (i.e. acoustic energy). In short, in the case of a blast, there is no way for the non-structural elements to rattle or vibrate unless blast energy is reached the main structure of the building through ground or acoustic energy of the blast can reach the non-structural elements. Even if the blast energy is reached the non-structural elements through air (i.e., acoustically), it eventually will reach the structure of the building. Depending on the energy level and frequency content, the energy may cause negligible damage, moderate damage, or severe damage. But claiming there is “**absolutely**” no damage is false and has no engineering basis. This is another way of falsely claiming a zero-damage.

In general, how energy reaches a building is shown to right. Note that there are two paths, both of which reach the building super structure. Note that blast energy reaches a building through air and earth, very much like an earthquake. For the non-structural elements to rattle (or vibrate), the main structure of the building must receive part of the blast energy. It is well known in the engineering community that vibration is responsible for accelerated fatigue and structural damage over a period of time when repeated shock waves (blast or earthquake) are induced in earth.

Due to lack of expertise in structural dynamics, Dr. Braslau compares the energy generated by kids jumping and doors slamming with blast energy. These are totally different dynamic events with totally different type of energy and frequency content. To make the committee understand this, his comparison is like saying an elephant can feel the weight of a fly sitting on its back. The mass of a fly compared with that of an elephant is so small that a fly has no significant impact on the elephant even if the fly jumps up and down. Kids and slamming doors don't generate large enough of energy to severely influence the dynamic of massive super structure of a building. Kids jumping or doors slamming don't generate any meaningful energy when compared with the stored energy in the super structure of a building. The frequency content of kids jumping up/down and doors slamming is also totally different than a blast. But the energy generated by a blast is substantial and should it find a path to a building, it could cause short or long-term damage. This is the first time I have come across a consultant comparing kids jumping or doors slamming with that of blast energy.

If one checks World Wide Web, one could be found a number of publications on blasting and that there is no way 100% of blast energy can be used for breaking rocks. In particular, in a report by Larry Schneider (PE) an engineer at the Division of Explosives and Blasting in the Kentucky Department of Mines and Minerals (at www.kytc.state.ky.us/d12/blastingfaqs.doc), it is stated that “*There is no way to design or detonate a blast that will use 100% of its energy in useful work. There will always be a small amount that will cause the undesirable effects of noise and vibration.*” Another interesting statement may be found at this web site http://rockproducts.com/mag/rock_why_people_complain/, it is stated that “*Many states limit quarries to 2.0 in. per second (in/sec) peak particle velocity (PPV) at the nearest non-owned structure. The industry complies with these regulations, but still gets complaints.*” In other

words, even though the industry meets the standard, there are still complaints from those who live around the blasting area. In short, meeting the standard does not mean people safety, health, or comfort is not compromised. Even though all such blasts have been legal and have met the local or federal standards, structural damages have been reported. Therefore asserting that a “legal blast” does not induce because it is legal is inaccurate.

Another publication that directly contradicts the claim made by Dr. Braslau may be found at www.epa.gov/Region3/mtntop/pdf/.../g/blasting.../blastingcomplaints.pdf. This report is written by Office of Surface Mining in Pittsburgh, Pennsylvania. The report indicates: “*Blasting complaints continue to be the most common type of complaint to the Office of Surface Mining Reclamation and Enforcement (OSM) and the state regulatory authorities (RA). Citizens and citizens groups have expressed concern for many years that the various regulatory authorities do not serve the interests of the citizens on blasting damage complaints. As a result, in FY 1999, the OSM Executive Council formed an OSM blasting team to conduct a national study. The study was designed to identify blasting trends in the regulatory program states. The survey did not assess the technical merits of the investigations. The study entailed collecting and analyzing readily available data in Federal and State files on citizens complaints related to surface coal mine blasting. For the purpose of the mountaintop mining environmental impact statement, 708 complaints from West Virginia, Kentucky, Virginia, and Tennessee were extracted from the national study. The national study tabulated 1,317 complaints, with 338 complaints at one surface mine in Pennsylvania.*” In another part of the report, the following classification of the complains was made, as shown below. It is noted that more than **75% of the complaints** have to do with **noise and structure damage** even though all these mining sites have met the standards of blasting.

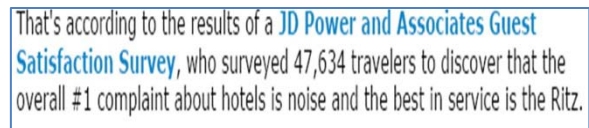
Table 1 Distribution of the complaints by type

Complaint Type	WV	KY	VA	TN	Total	Percentage
Dust and Fumes	11	9	9	0	29	3.0%
Fly Rock	5	7	3	0	15	1.6%
Annoyance/Noise	278	177	75	4	534	55.6%
Water Quantity/Quality	38	44	8	6	96	10.0%
Structure Damage	85	110	38	3	236	24.6%
Other	10	31	8	1	50	5.2
Total	427	378	141	14	960	100%

In the same publication, the types of reported structural damages are discussed. It is stated “*Alleged damage to structures (residential dwellings) accounted for 33% of the complaints. Damage allegations include interior cracks, foundation cracks, concrete floor cracks, brick veneer cracks, roof leaks, door misalignments, windows, personal property, etc.*” I believe these findings are in direct contradiction to the claims made by Kraemer and its consultant.

I strongly suggest that the committee requests that Kraemer offers suggestion why these many complaints have been filed while all the blasting events have met the standards. Disputing the reality of reported data on damage by blasting energy is like putting blinders on.

4. In the Kraemer rebuttal, it is indicated that Dr. Allaei did not submit any supporting document. If Kraemer and its consultant would have read the report, they would have realized that Dr. Allaei was not hired to produce any data, rather he was hired to review and express an expert opinion on what Kraemer was produced as supporting data and experts. The Kraemer's consultant does not even have formal training in structural dynamics, let alone be an expert in this area. As it was indicated in the first report by Dr. Allaei, Kraemer failed to present any real engineering data on the safety of the blasts or levels of noise and vibration around or in the houses surrounding the mining operation. Their focus was on meeting standards of other states. As it was clearly discussed in the last report prepared by Dr. Allaei (PE) and under items 3 above, meeting standards does not necessarily make the blast safe, nor does it automatically make the noise level go away. Kraemer made many unsubstantiated claims on their application. After a closer review, it was discovered that their noise and blast expert has no or minimum expertise in structural dynamics. The latter explained why they have made such claims with no engineering or scientific basis. The best defense Kraemer provided in its rebuttal was this statement from Dr. Braslau stating that *"This comment suggests lack of awareness of the extensive amount of research and testing performed over a number of years by the US Bureau of Mines on residential structures for safe blasting."* As Dr. Allaei indicated in his report and presentation, there have been ample cases in the history and in the mining around USA where they all have met the standards and yet either their workers or their environments have been negatively impacted by the mining operations (see the chart in item 3 above). The simplest example I can give Kraemer and their consultants is the fact that most (if not all) buildings and bridges in California and Japan nowadays meet the building codes and standards related to an earthquake (that is very similar to blast). However, we have all witnessed the devastating impact of an earthquake and the number of fatalities in recent years even when they have met or exceeded all the structural codes and standards. Hotels and hospitals meet the building codes and standards, but noise and vibration have been major issue in hotels and medical facilities. See the articles by John Hopkins University and JD Power and Associates Guest Satisfaction Survey. It should be pointed out that meeting the standards and following the engineering codes is ONLY the first step toward good engineering practice.
5. In the rebuttal by Kraemer, the following thoughtless statement was made. *"The QRDC consulting comments are also biased. Dr. Allaei of QRDC stated in his presentation "I didn't charge the Town as much as US Defense because the reason I told the town was I do boat in this area, I love this area, so I think we do need to pay attention to what is happening here" (~2:18:30 on recording from 10/21/09)."* I don't know about Kraemer and its consultants, as a professional engineer ethics and integrity is out most important in my practice.



Acknowledging that I care and like the area around the Town does not mean I step over my personal and engineering ethics to prove a point. However, Kraemer evidently does anything to get their way.

6. It is claimed that “*Kraemer M&M uses licensed blasting companies who work all over the country.*” Do Kraemer and its consultant imply that other mining companies did not use licensed blasting companies and that is why there has been so many reports and complaints. This is a claim out of desperation. Of course it is given that Kraemer must use licensed blasting companies. If they don’t, they have violated the law and should there be any loss of life, criminal charges may be pursued. In short, Kraemer has no choice by using licensed blasting companies. However, this does not make blasting “absolutely” safe, as they want the Town to believe. All it means is that the danger to workers and surrounding area is minimized but by no means blasting by licensed personnel is danger- or damage-free.
7. Kraemer stated that “*The statement that "even though the blasting technique and the resulting seismic activity might meet the state or federal regulations, it did not necessarily mean they were safe for this particular area." appears to show disdain for state and federal regulations by suggesting that they do not apply to this particular area, or that they are wrong. This statement by Dr. Allaei is simply incorrect. Safety with blasting activities is addressed by state and federal standards that are applicable at the site being evaluated.*” Basically Kraemer is ignoring all the reported complaints about structural damage and annoying noise by the residence in VA, PA, and other states (see the chart above). Kraemer is simply arguing that any blast that meets the standard must be safe and free of health hazard for people around a blast. I let the reported data speak for itself. Kraemer and its consultants have not presented any meaningful or engineering argument to prove the blasting will be safe and damage free. All they claimed is that they will meet the standards. As it was shown by previous reports, published data, and proven records of overwhelming number of complaints, past blasting events that met the standards and were carried out by licensed personnel did create unsafe environment and did create structural damage to surrounding houses. See the items 3 and 4 above. **Kraemer and its consultants simply lack the required expertise in structural dynamics to be able to assess and argue with solid engineering evidence. They only rely on the regulations and thereby make a false assumption all will go well.**
8. Kraemer and its consultant did not offer any engineering argument about reducing or controlling noise generated by mining operation. However, they use their old argument that others have used it, so it makes it right, or they argued that they meet the standards and thereby it makes it OK. Based on the data presented in sections 3 and 4 of this rebuttal, it was clearly shown that their argument does not hold any water. Based on their argument, it appeared that they have no real experience how to deal with noise generated by mining operations. The use of trees and earth berms will not eliminate the negative impact of noise on the surrounding houses. If that was the case, there would exist no complaints about the noise generated by mining operations. Kraemer and its consultant misrepresented Dr. Allaei’s reports so they could mislead the county committee. For example, they misrepresented the following statement made by Dr. Allaei (PE). They reported the following: “*I would be very surprised if Dr. Allaei has never experienced the reduction in sound behind a natural topographic feature or a man-made topographic feature (earth berm).*” Dr. Allaei never stated that earth berms do not result in reducing noise. Dr. Allaei

claimed that the earth berms would not reduce the noise generated by mining operation to sufficiently low levels to eliminate annoying and discomfort impact of the mining-generated noise on the community. Misrepresenting Dr. Allaei's report is not evidence that Kraemer has shown any meaningful engineering argument to show to the committee they will reduce the noise to acceptable levels. Dr. Allaei (PE) stands his position.

9. Kraemer and its consultants have decided to dispute Dr. Allaei (PE) argument based on no meaningful argument. For example, they stated that "*Apparently, Dr. Allaei is not familiar with the US Department of Labor Mine Safety and Health Administration (MSHA), which has promulgated occupational standards for employees involved in mining operations. These rules are strictly adhered to by Kraemer M&M.*" Once again they made misleading and false assumption. In fact, Dr. Allaei (PE) has worked on the behalf of 3 out of 6 mining operations in North MN. All mining operations in North MN have been subjected to citation by the very department, MSHA, Kraemer has referred to. Dr. Allaei (PE) is far more familiar with MSHA than Kraemer and its consultants ever are. The reality of the matter is that there are many mining plants that are subjected to citations from MSHA and to lawsuits from their employees because of the effect noise and/or vibration has had on the employee health. Kraemer and its consultant have made no meaningful engineering argument. At best, they claimed that they would meet the standards and they would comply with regulations. Well, I don't know of any mining operations that they don't claim that they comply with law and regulations, and yet they are often subjected to noise and vibration citations and health issues arose by workers. Dr. Allaei (PE) was hired as a noise/vibration consultant for one of the mining companies in North MN in 1998. After collecting data, it was shown that the vibrations and noise generated by some of the plant machines was reaching the plant offices about 0.25 miles away from the noise source. In fact, the conference room in the office area was rendered useless due to excessive vibration levels. This was happening while the plant was meeting the standards and regulations set by MSHA. Kraemer and its consultant are long ways away from learning how noise propagates and how complicated structural dynamics can be.
10. The rest of the Kraemer's rebuttal does not deserve a response since they kept repeating themselves. They did not present any new data or any meaningful engineering argument. They basically claimed their argument is correct because they said so. It appeared as Kraemer and its consultant believed by putting together bunch of words that make no meaningful engineering argument they can get by and get their application approved. It is believed that they have presented no engineering case in their rebuttal.
11. Kraemer and its consultant claimed that "*There are currently no applicable general noise standards that exist in Polk County, WI.*" Based on what the Town has shown on its web site, the Town of Osceola has approved a set of ordinance that addresses mining operation and related regulations that has to do with impact on environment and safety, such as noise. Therefore, their claim is false.
- 12. It is recommended that the committee should evaluate the claims made by Kraemer in real terms and require that Kraemer provides real engineering data.**

- 13. First, Kraemer can conduct one or two sample blasts and measure ground motion and noise level near the houses within 0.5 mile of the blast. This data will provide the County with solid evidence on what the blast might do to the people and their houses in the community.**
- 14. Second, Kraemer must be required to measure the baseline noise level within 0.5 mile radius of the proposed mining operation. This will allow the County to have a baseline data to which any future complaints can be compared.**
- 15. Third, Kraemer should temporarily operate one or two of the loud machines on the proposed mining site and measure its propagated noise at or near the houses within 0.5 miles from the noise source. This data can be compared with the baseline noise data collected under item 14. If Kraemer is right, the collected data will prove their claims and thereby they can be allowed to start their mining operation. This is the best way to put these arguments to rest and make decisions based on real engineering data.**