# Meeting Minutes

## ARCWG Sub-Meeting: Blasting & Flyrock

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| Location: | Caledon Town Hall, Mayfield-Palgrave Room<br>6311 Old Church Rd, Caledon East, ON |
| Date: | April 24, 2024 |
| Time: | 05:00 p.m. – 06:48 p.m. |

**In Attendance**

Ian Sinclair (IS), Joe Nethery (JN), Xavier Costa (XC), Niel Morris (NM), Jane Thompson (JT), Tony Sevelka (TS)—guest invited by ARCWG members, Ray Jambakhsh (RJ)

**Agenda Items**

**Ray's Presentation (5:10 p.m.)**

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- RJ: Professional engineer, expertise mining, master's in applied physics in engineering. Blasting, vibration, noise. 37 years in industry, working with Rakowski. Explosive demolitions
- Typical quarry operation:
    - Hard rock vs soft rock
        - Most Ontario rock formations are hard rock.
        - Granite is brittle
        - Southern Ontario has more soft rock. Limestone is soft rock and is more absorbent like a sponge
            - Blasting used in soft rock should not be put in a hard rock quarry because the parameters change
- Blasting operations
    - Inherently produce the following:
        - Vibrations
        - Overpressure – the low frequency component of noise we can't hear, but only feel (air blast)
        - Flyrock
        - Dust

        - These are all undesirables and the impact of them can be minimized by changing by some of the parameters in controlling the blast
    - All incorporated in blast design (*terms from the typical blast diagram*)
        - The purpose of this session is to make sure from policy view is to weed out actors — we need professionals that know the job to do the job
    - Blast plan
        - There are parameters that are of our control (*blast design parameter details)
        - How do we determine how much explosives to use in a given hole to stay in the guideline (vibration):
            - You find the size of the hole then determine how much explosives can be put in
            - Ex. A 4-inch hole filled to a level that doesn't exceed the quantity of explosives we can reduce to lesser the size of the hole or divide the hole
- Vibrations are undesirable
    - Guideline (governing bodies MNR) - Peak particle velocity (PPV) 12.5mm/s
    - Vibration is considered environmental pollutant
    - Measure of vibration – velocity – is measured using sensors
        - Used in ALL guidelines and specifications
    - Source of vibration could be trucks, blasting, train, etc. In this case blasting
        - In Ontario, the upper limit vibration is 12.5 mm/s. This is what is used in our guidelines
    - Vibrations – frequency has a very important affect
        - Low Frequency: Unique to earthquakes and allows building to react to it
        - High Frequency: Comes and goes before building have a chance to react to it – still measurable
        - Blasting's are always high frequency (Exception: coal mines because of the size of holes they use to displace coal)
        - Never reach earthquake frequency level
    - Vibration type
        - Compressive waves – move particles within a medium speed wave
        - Sheer waves – follow compressive waves, which is why they are slow
        - Surface waves
            - Raliegh waves - travel along surface of earth
            - Love waves - spiral
    - Vibration control
        - PPV directs related to quantity of explosives
        - Source quarry and Observation point–sensitive receptor (residential buildings) are unchangeable
        - What we can change is the quantity of explosives
            - This includes pattern, depth, etc.
        - First, you design blast, then the pattern, then equipment, but all starts with PPV
            - Cylindrical charge: sensor looks at it as a cylinder
            - Spherical: sensor looks at it as a sphere. Most quarries use spheres
- Overpressure (noise)
    - People hear things,
    - Overpressure is regulated at 128 db
- Flyrock
    - Most important and discussed by product from blasting
    - Been pushing to have clearance and understanding of the guidelines associated
    - Most incidents from flyrock are produced from construction not blasting
    - No good statistics

- Piece of rock propelled by blasting site outside of the blasting area
- Blasting site – where it is doing blasting – MNR: the boundary
    - Blaster POV, blasting site is where the blasting is happening, from MNR's it's the licensed boundary
    - Blasting Area vs Blasting Site
- Hazard
    - Aggregate Resources Act - Only applies to quarries and mining, not construction
    - Site is the perimeter of licensed area
- IS: MNR is determined to license the entire property
    - RJ: but if you go further – MNR indicated in proposed policy they are still defining it – IF there is vacant land, at some point could be private residence – quarry operator has to adhere to 500m so he can't design his blast that would affect that receptor, they have to scale back.
    - You can only find deficiencies after it is exposed, as quarry goes on, they need to consider geology and rock geometry
    - There are types of explosives that are less susceptible to producing flyrock although they are more expensive.
    - Patterns should be made to reduce quantity of explosives
    - When drillers drill, if there are cavities, they know it, so they need drill logs, note it and give it to blasting crew
        - Before blasting people blast, they need to read drill logs
- Flyrock origin and geology
    - Rifling: cover hole, if depth is too much it can't fracture and rifles
    - Cratering: not enough
    - Good blast = consistent spacing
    - Intrusions – soft layers, create pockets, blasting explosives gets into cavities - "freak flyrock". There are remedies to prevent this
    - Other causes: angled holes, ground cavities, uneven rock face, not enough collar
- Hazard mitigation, pay close attention to parameters we can control
        - Drilling pattern
            - Don't drill too big of a pattern – it can blow upwards
            - If pattern is too small – one hole could set off the other
        - Underload: too little explosives – effects the vibration too
        - Overloading: too many explosives, need to find the happy medium which is calculable
        - Initiation sequence: directing flow of the blast – best thing is to direct away from receptors
        - Type of explosives: more expensive but produces good results
        - Proper planning (of both site and blast) to avoid unfavourable blasting patterns
        - Use of flyrock prediction models
        - Predicting range – caution: just a model, a good tool to be used with experience, don't rely on it
        - Communication with drillers

**Tony's Presentation (6:25 p.m.) )**

- TS: Undergrad in real-estate studies, studied planning and development, site plan approval, 50 years of experience appraising, read zoning bylaws secondary plans, expropriations, papers published, 4 1/2 aggregate extraction, published a book, published papers on flyrock

- There is no definition of flyrock in ARA – it's not forthcoming, and no reasonable efforts to do so
- There is still no protocol on flyrock – Ministry have known about it for years
- They have never done a study on flyrock incidents, I have done studies, can tell you about the incidents from the papers
- I have documented over 250 flyrock incidents, out of all of them 78 ended in casualties
- Blasting creates flyrock
    - Comes in all sizes – ANYTHING on the site (tree trunks, rocks, sand)
- When it comes to calculating throw (how far flyrock travels) there are 5-6 formulas to calculate it, but none of them are accurate or scientific
- If you have 100/year quarry will last at least 100 years
    - Not interim uses, you can't say the quarry will be here for a few weeks (will impact people's lives)
- If people are already settled – quarries should not be placed there – makes no sense
- If a blast site is 500m and fly rock goes 499m it doesn't count as incident – we need to understand these distances
- Flyrock can travel over 400 miles/hr
- Blasting creates toxic fumes, vibrations, flyrock –ultimate adverse effect
- Overall goal should be to protect health and safety of public – not the aggregate extractors
- Adjoining neighbours are not being compensated – nothing stopping municipality from having a greater set back
- This flyrock will go wherever it feels like
- Interferes with public and private
    - e.g., Goes on farmers land – won't see it 6 months, ruins equipment and don't get compensated
- Post-Covid – people are home based, therefore even more of a problem
- Blasting lasts more than 10 seconds
- Seismographs: Sensitive receptor – trespass
    - They measure vibrations – not the reaction of buildings to vibrations
    - They should be 1mm/s instead of 12.5mm/s
- From a planning perspective, it needs to be looked at as a land use that will be present for generations
- I know the Town could do 3 things
    - **Permanent onsite setback of 500 meters (equivalent of an excavation limit) imposed on the quarry site**
    - **Permanent offsite minimum separation distance of 1000m between boundary limits of a quarry and settlement area, rural cluster, or sensitive land use (broadly defined)**
    - **Pass a noise and vibration bylaw under the Ontario Municipal Act, which restricts vibrations at the boundary limits of quarry to a maximum of 2mm/s. (A municipality can legally impose noise and vibration restrictions that are more onerous than required under the Ontario Environmental Protection Act**

**Discussion**

- IS: I have a question related to vibrations of blast through bedrock systems to RJ
    - RJ: Vibrations need a medium and path to travel/reach to given point. Bedrock characteristic plays a huge roll. As vibration travels through bedrock, intrusions, as they enter another medium – part in reflected and fractured – they dissipate, nothing in ground that can amplify vibrations (exception: if you have a channel, once it reaches

interface, it may amplify,). The point is, if you have a close residence, and you have to maintain vibration below certain level (12.5 mms is the guideline) and you see how many explosives you can blast at a given time. Then you select size of the hole, and then proceed with design
    - In our experience – in almost all circumstances, the vibration is always lower than the one that was calculated. A number of safety factors incorporated in the calculations
- IS: If I am a quarry operator and coming up with a mm/s, there is sensitive land use – how do I measure that? Right at the houses, property lines?
    - RJ: In our circumstances we cannot trespass and will not for our own security. We will set it up at boundary facing the quarry
    - IS: Is that ground vibration?
    - RJ: Yes. There is protocol you have to follow; you need to install it and it record it
- IS: What about atmoshpereic conditions, if it is a dry day vs humid day, how do you deal with that?
    - RJ: Not all blasting operation are carried out with this in mind – specifically sensitive lands – but installing a weather station (noise, vibrations, dust),
    - Ideally a blast could wait a few days – blast when conditions are low
        - We waited a week to blast in southern Ontario for the right wind direction
- TS: You don't need a license in blast. We have bylaws on fireworks but not on blasting
    - RJ: I agree and have been advocating for this. I don't know why they don't license but I am licensed – it's voluntary
    - **NM: Can we have something in the Official Plan that requires a license?**
- IS: From what I am learning, from TS and RJ, there is a lot of trade craft. You have to have high ethics to manage all this (designs, weather station, construction) So how do we have a policy to govern that? But one that doesn't deal with ground vibration – so this is a conundrum
    - Someone in Caledon had a water quarry application and now we are interested in blasting water and more things. So **how do we deal with this from a policy perspective when it's trade craft?**
    - This has been designed and managed to protect the aggregate industry
    - RJ: Thats not the case
        - IS: With my experience – the inspection in non-existence
        - RJ: Most of us want peace and are willing to do due diligence, to protect the public and workers. The best thing is to set standards within your means. Set policy that you can live with
    - TS: Enforcement does not exist. "We have no record of it"
- IS: Tradecraft. If we could rely (we currently don't) on MNRF to put together policies, we need weather stations, we need to measure these polices. How do we address this from a policy perspective?
    - Policing policy—if it can't be enforced it can't work
    - TS: If they are in violation, what do you do?
- IS: I think the "No blasting required - Erin pit extraction" - somewhere in there is a policy phrasing that if springs stop, quarry needs to be shut down. If vibrations were chronically high, you'd have to shut the operation down. But with how legislation is set up, municipalities have no say.
    - The other issue industry in coordinated in OSSA. This is an imbedded cartel, they add new regulations and changed site plans. The operator starts changing zoning and agreements
    - TS: This is because we need to control the external environment – the only way to do this is through setbacks. What they do on site becomes less relevant so they can't externalize their cost as much

    - IS: Where TS lives, to maximize profits, there are notions of areas and of notions distance, a lot of it has to do with mitigation which ends up being a governance problem for us – we need to get at that.
    - In Acton there are massive quarries, once they are there for a long time, they start buying sensitive lands
    - TS: Yes, I have written about this. In Acton they bought 13 homes (that they destroyed) and none of the properties appeared on MLS
- IS: Can we gain a copy of these slides?
    - JN: yes
    - RJ: It gives you an idea. We can blast anything at any distance, but it gets expensive. There are circumstances you have to blast. So, we design the blast so that we can blast. We are here to comply with existing regulations. We think there is some merit in some of these studies
- NM: I just want to echo the comment from TS. There are issues with Provincial government that we have no control – we need to be mindful of them without being too caught up trying to change the Provincial policy as it's outside of the scope for this project.
- JN: I will follow up with JT. Thank you for the extra time being there. It will be a hefty package when it arrives.
- IS: I have gained confidence that things can be done right
    - NM: Just like CVC – how do you make sure it gets done well?
- IS: As a policy idea – can **we put in that wherever there's need for blasting we need a licensed, experienced, blaster?**
    - NM: That's what I was saying earlier, policy that makes license mandatory to be a blaster
    - IS: Needs to be put it into the official plan
- TS: I have seen bylaws that control the municipalities with onsite setbacks and called them extraction limits
    - IS: Yes, but that goes under zoning
    - TS: it would be difficult for the Province to mess with the setbacks and that is in the justification of the Municipalities.