



24 July 2007

HOLCIM CEMENT PLANT AND ASSOCIATED QUARRY/PITS, WESTON, OAMARU

LIGHTING ASSESSMENT

The lighting for the site shall be designed in accordance with the following purpose, objectives and other matters.

1. Purpose

To minimise the effects of spill lighting and glare from the lighting of the sites required to enable the operational activities authorised by this consent.

2. Objectives

- To provide the fixed lighting to ensure the safe operation, maintenance and security of the plant and equipment at Holcim sites.
- To minimise the effects on the surrounding environment of spill lighting.
- To minimise the effect of glare on the surrounding properties.
- To minimise the effects from site lighting on the night sky.

3. Sites Addressed

- Windsor – Silica Sand Pit
- Ngapara – Lignite Coal Pit
- Weston Quarry
- Weston Cement Plant

The above sites comprise the proposed Holcim Cement Works and each area, with the exception of the Windsor Silica Sand Pit, where there will be no fixed lighting, will be addressed further in this report.

4. Action and Methodology

The following are the aspects of the lighting installation which need to be addressed as part of this consent application.

4.1 Glare / Spill Lighting

The aspects of lighting that need to be considered are spill lighting and glare.

In any lighting installation, there is almost always a certain amount of illuminance that is unable to be contained within the area being targeted. This uncontainable illuminance (lighting) is referred to as 'spill light'.

Spill light increases the level of illumination outside the target area and is measured in 'lux' (lumens of light flux per square metre), the standard unit for illumination levels.

To assist with the understanding of illumination or light level, and the unit of measurement lux, identified below are some typical illumination levels.

- Under a clear sky on a sunny day 100,000 lux
- In the shade of a tree 10,000 lux
- Inside a north facing window 2,000 – 3,000 lux
- In a typical office 300 – 750 lux
- Inside a domestic house at night 50 – 75 lux
- Under a suburban street light 5 – 30 lux
- Moonlight 0.5 – 1 lux

In a typical rural environment away from towns at night, the ambient lighting level would be in the range of 'moonlight' to virtually zero.

Spill lighting has an impact on the immediate area surrounding the installation, and although the lighting can be designed to minimise the amount of spill, inevitably some spill will occur outside the target area.

Although the Waitaki District Council does not have any rules in their District Plan for the containment of spill lighting, it is proposed here to provide some conditions which would address the concerns of the communities adjacent to the sites which comprise this proposal. Such conditions, also, will provide a quantitative benchmark for the benefit of the submitting Company.

PROPOSED CONDITIONS

- Any fixed exterior lighting directed away from any adjacent properties and public roadways.
- 10 lux spill (horizontal or vertical) onto any part of any adjoining property that is within 20 meters of a residential dwelling, measured at a height of two metres above ground level.
- All fixed lighting shall be shielded and aimed in such a manner that the light source is not directly visible from outside of the industrial site.
- Where maintenance is required on the plant at night, the above spill light conditions may be relaxed in magnitude by a factor not exceeding three for a period not exceeding 30 days per year.

The above limitations of spill lighting can be achieved by a combination of:

- Careful lighting design and appropriate luminaire selection.
- Subsequent landscaped and bunded areas around the sites.
- Directing, aiming and shielding exterior lighting fittings away from the rural areas adjacent to the sites.
- Construction of buildings with minimal windows facing adjacent rural areas if the windows are in the field of view from such areas.

It can be seen therefore that if the spill lighting levels are contained within the values proposed above, then the effect at an adjacent dwelling would be less than the light level measured between two suburban street lights.

The second element which needs to be considered and controlled is glare.

Unfortunately most District and City plans confuse glare with spill lighting.

The term 'glare' is commonly used in reference to several phenomena. New Zealand Standard NZS6701:1983 'Code of Practice for Roadway Lighting' defines glare as

“the discomfort or impairment of vision experienced when parts of the visual field are excessively bright in relation to the general surroundings”

The two terms that are normally used to describe the effects of glare or the ability to see, are disability and discomfort.

A typical example of disability glare is the glare from approaching car headlights on the open highway at night, which prevents anything else being seen on the road. The eye is unable to adapt to the bright headlight and to the significantly lower brightness on the road at the same time. Hence the glare is having a disabling effect. As a comparison, the same vehicle approaching with its headlights on during the day will cause no disability because of the brightness of the surroundings.

Discomfort glare is where a light source can cause acute discomfort without affecting the ability to see (eg a bright sky on a sunny day can cause discomfort, particularly to those who are used to wearing sunglasses and are without them). However the ability to see is not impaired.

The key difference between the two is that disability glare has a physiological effect and can be objectively measured, whereas discomfort glare has a psychological effect and is much more subjective. What may not cause discomfort to one person may cause significant discomfort to another.

Universally there appear to be no accepted or adopted standards or practices to quantify acceptable or unacceptable glare. Various methods have been promoted to quantify glare based on brightness differential, but none of these have met with universal acceptance.

NZS 6701 promotes the provision of lightly coloured backgrounds to minimise glare on roadways. This factor would be taken into account during the detailed lighting design to minimise the effects of the lighting.

5. Specific Issues

The foregoing addresses the issues of spill lighting and glare, attempts to clarify the difference between them, and has identified some suggested conditions to minimise the effects of both issues.

We now consider specific areas and examine how lighting effects could be addressed.

5.1 Ngapara Lignite Coal Pit

The Ngapara site is an elevated site (largely hidden from public views) where only on occasions will normal quarrying activities operate after daylight hours and then only until 10 pm on week nights.

The lighting to be considered is:

- At site entry
- On accessway
- At workshop
- In quarry (on week nights to 10 pm)

It is recommended that the Entry and Accessway lighting would be designed in accordance with NZS 6701.

The workshop would be provided with minimal windows, and the visible lighting therefore on the exterior and from within would be similar to that produced for a standard milking shed in the area, and as such would produce little impact on the immediate or distant visual fields.

Earthmoving machinery lights are expected to be largely sufficient when lighting is required in the quarry. If required, the quarry would be provided with portable lighting able to be moved around or mounted within the quarry illuminating the work areas within the pit. This is largely task lighting aimed at specific locations, as against general lighting of the area.

Because of the nature of the lighting, it is anticipated that it would have minimal effect upon the immediate and distant visual fields.

5.2 Weston Quarry

The Weston Quarry comprises two quarry sites being:

- the large limestone quarry behind the escarpment
- the smaller Tuff pit in front of the northern part of the escarpment, which is sited almost down onto the flat land.

The large limestone quarry being excavated from behind the escarpment effectively forms a sunken amphitheatre and as such very limited views are available into the operation.

The smaller Tuff pit location can be viewed from a greater number of locations, but the quarrying operation will not be widely visible owing to it being carried out largely below ground level.

The lighting of the entrance to the access road should be designed in accordance with NZS 6701 and therefore would be similar to the illumination of any other secondary road.

The lighting of the Workshop areas both interior and exterior would be of no greater effect than a standard milking shed would produce.

There would be lighting on the crusher and this should be aimed in a downward direction with minimal spill from the site.

No fixed permanent lighting would be provided on the haul road or in the Tuff/limestone quarry themselves., Any lighting required would be provided on vehicles or machinery sources.

Given the above, quarrying operations on the occasions when they are carried out during the evening will produce minimal effect on the ambient illuminance of the area.

5.3 Cement Plant

The Cement Plant is probably the most significant in terms of modifying the ambient lighting in the area.

The entrances and carparks should be illuminated in accordance with NZS 6701 and as such would be designed to minimise glare. In all District and City Plans entry and roading lighting is excluded from the requirements for spill lighting, as such provides for increased security of the area.

Interior and exterior lighting for offices would provide minimal effect upon the ambient lighting level of the area, but any exterior lighting should be designed such as to ensure that the light sources are not visible from away from the site, and that any exterior lighting minimises spill lighting to the values previously nominated in this submission. Spill lighting from the site will of course be minimised by the proposed bunding and planting around the site.

Lighting for rail and truck loading will be obscured by buildings in the viewing area and as such will not contribute to viewable spill lighting or glare.

Navigational lighting, if required, will be at the red end of the spectrum, possibly mounted above the chimney. The red end of the spectrum does not produce a glare problem or discomfort for the human eye.

6. Conclusion

Although the lighting for the plant will increase the ambient lighting level in the area, with careful design, it is our opinion that the plant will not be a distraction in the area, and will in fact be an acceptable neighbour in the proposed environment.

The following are the key areas which the design for the plant needs to address:

- Design of detailed lighting provision should be in accordance with a lighting management plan to be prepared in accordance with the purpose and objectives set out above.
- Lighting sources should not be visible from external viewing locations in order to minimise glare.

- Spill lighting from the site should be minimised to 10 lux spill (horizontal or vertical) onto any part of any adjoining property that is within 20 meters of a residential dwelling, measured at a height of two metres above ground level.

It is considered that the lighting associated with the operation of this cement plant will raise the ambient light level in the area, but not such that it will produce a major distraction for the rural community.

By way of comparison, this plant should have less effect on the rural community than the existing MDF plant on the banks of the Ashley River, north of Christchurch. This plant is a 24 hour, 365 days per year operation, highly illuminated, but produces little glare as the background structures are well illuminated producing a greater visual area.

PEDERSEN READ LTD

A handwritten signature in black ink, appearing to read 'A J Read', written in a cursive style.

Andrew J Read
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Chartered Professional Engineer