

Transportation Construction Cost Impacts of Air Quality Regulations

EGCA Report to SANDAG

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The Engineering & General Contractors Association (EGCA) has reviewed the potential transportation construction cost impacts of several proposed, pending or imminent air quality regulations under consideration by the California Air Resources Board (CARB) or the local Air Pollution Control District (APCD) in the following six areas:

1. upgrade all equipment to Tier 4
2. work equipment 5.5 hours a day maximum
3. shut down all idled equipment after 5 minutes
4. use biodiesel
5. shut down the project when wind is 25 mph or greater
6. provide continuous water trucks and other measures to control “fugitive dust”.

While it is difficult to accurately quantify these unknowns, several of our most experienced road construction and grading contractors have analyzed these proposed measures and have projected the following costs:

1 – upgrade all equipment to Tier 4

The required upgrades of equipment to the next Tier (from current Tier 0 and Tier 1 to all Tier 1, then Tier 2, then Tier 3, then Tier 4¹) is a capital cost that will be recognized in the cost of doing work over a period of time. Large construction equipment often has a useful life of 25-30 years. Contractors’ capitalization and equipment replacement budgets have been based on these industry standards for half a century.

For example, for one of our contractors, a single 657E scraper engine retrofit (Tier 0 to Tier 1) recently cost \$250,000 through Caterpillar. New large earth-moving equipment can cost in the range of \$1.6 million each.

¹ CARB documents identify Tier 1 engines as, depending on horsepower rating, those manufactured between 1996 and 2001-2002. For engines larger than 750 horsepower, the engines are those made in the years 2000-2005. Tier 1 is the current “state of the art”. We are nearing SOME availability of Tier 2. “As of 1/1/08, small fleets are prohibited from adding any mobile diesel-fueled off-road compression ignition equipment with a Tier 0 or Tier 1 engine to their fleets, unless it has been retrofit with at least a Level 2 control device” [no such approved devices currently exist]. “As of 1/1/17, small fleets may no longer operate equipment with a Tier 0 or Tier 1 engines” unless similarly retrofit. The final Tier 4 will be in effect for all engines of any horsepower by 2015.

The problem we have with this approach is that we don't know how many times this will have to be done with the equipment in the future, per tier (ending at least at Tier 4 – we are now at Tier 1). Will it be a simple modification of a Tier 1 engine to go to Tier 2 (and 3) or will it require new equipment? We don't know this because the technology has not yet been invented. We would surmise that as the Tiers get higher and the ability to retrofit equipment diminishes, costs for dirt moving, for example, will go from a current \$1.25 per CY to \$3.25 per CY and large project production will diminish to perhaps 30% of current high production rates, or less.

The issue here is that older equipment will be phased out prior to the completion of usable life and the available market for selling this equipment will determine each contractor's ability to bridge this from old to new. There will be a lot of existing equipment that will become unusable, significantly increasing contractor costs.

Generally, it is anticipated that the current practice of using very large machinery will be replaced by a more European model of using more smaller machines (whose engines can more readily meet the new air quality requirements).

For example, a moderately large earthmoving project may have 2-3 bulldozers, 8 scrapers, 1 wheel dozer, a motor grader and 3-4 water trucks and move 20,000 CY per day for a cost of \$1.25 per CY. The "replacement" spread at some point in the future may be one bulldozer, 4 articulated trucks, 1 wheel dozer, a motor grader and 2 water trucks moving 4,500 CY per day for a cost of \$3.25 per CY.

2 – work equipment 5.5 hours a day maximum

The impacts here are that the equipment will only be used for 5.5 hours instead of the normal 8-10 hours per day. Under current union and most non-union agreements, the employee will be paid for 8 hours even if he works 5.5 hours.

For road projects, equipment costs comprise approximately 20% of contractors' total costs. If they are only able to run 69% of a shift on the equipment ($5.5 / 8 = 69\%$), then the equipment cost would go up about 13%.

Considering that all equipment requires mechanics and operators, the labor cost could add another 15% (i.e. mechanics and operators also must be paid for 8 hours even though they only work 5.5 hours).

It is difficult to quantify how the loss of equipment use during 2.5 hours per shift might impact productivity of other non-equipment labor and site supervision on the project.

For private development projects, one contractor estimates that the total direct impact could be as much as a 46% increase in the cost of the work, inclusive of losses of equipment costs (anticipating full value for idled equipment), labor costs, overhead costs, etc.

The schedule might also extend by as much as 30% to 40%, adding other carrying costs for the owner including inspection and construction manager costs which will increase directly proportional to the time, SWPPP costs which will increase as a result of extended project duration, and general supervision which will also increase. Contractors' bids under these new conditions will include much higher field overhead and home office overhead, simply based on the extended duration of the projects.

We have not begun to calculate the inconvenience to the public, and the extended drive times on major corridors, as impacts for longer construction project durations.

3 – shut down all idled equipment after 5 minutes

This is a very big issue for some environmental groups and likely will become a requirement. Large diesel engines must be warmed up before being used. This is often a 10 to 12 minute period and requires a trained mechanic (often a union mechanic), as equipment operators are not trained in these procedures and using untrained persons risks voiding warranties and damaging the engines (which often cost as much as \$250,000 each).

Some foresee that equipment spreads will be fired up starting at 5 to 7 minutes (start time), and equipment will start moving as it reaches temperature, hopefully within five minutes. The equipment will not be productive until it is all moving, which on large projects will take 20 minutes or more. The same thing will happen at the lunch break. Some anticipate the total impact of one hour per day lost, placing the cost impact in the range of a 15% increase due to lost production time during the day for the operator waiting for equipment to be started on large projects.

On other projects, using individual pieces of equipment working alone, the cost increase might be limited to as little as 2%.

This will also act as a compounding increase to the schedule by approximately 15% +/- and cause an increase in associated Owner costs, as described in #2 above.

4 – use biodiesel in lieu of current petroleum-based fuels

As current biodiesel prices, one contractor estimates that in their case, because fuel is such a small portion of their work, it would be less than 1% cost impact. However, the availability of large quantities of biodiesel has not been investigated.

5 – shut down the project when wind is 25 mph or greater

It is difficult to estimate the percentage of time that this will happen during a project. It will be a "regional" issue (occurring more often near the San Gabriel Mountains, for example, or in the Imperial deserts, than in San Diego area). It might be possible to contact the US Weather Service to determine the number of days per year and hours per

day when the wind reached 25 mph, then factor this for time of day and excluding weekends and holidays. This is not a calculation we have performed.

6 – provide continuous water trucks and other measures to control “fugitive dust”

The APCD is only beginning to develop “fugitive dust” regulations, and they anticipate it will not be until late 2007 when they have formulated these. Something will come into being, and likely it will involve more water trucks continuously working each project, plus other measures to control fugitive dust from sand blasting (potentially a huge change in methods or protection), dirt roads, grading, stockpiles of materials, demolition, rock crushing, etc. The APCD has identified 17 different sources of fugitive dust.

We can only say that there will be an impact and it cannot currently be quantified.

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