Group #3 - Carbon Metrics Task Group

The aim of the task group is to derive functional, easily measurable units that benchmark our carbon emissions for various techniques.

Currently ground Engineering contractors optimise and reduce CO_2e through:

- Design knowledge and historical performance of similar foundations
- Utilisation of working and preliminary test piles to reduce Factors of Safety
- Adoption of alternative techniques and refinement of existing ones, e.g. screw piles, ground improvement etc.

Increasingly our members are turning to optimisation of concrete mix designs to further reduce the carbon on their projects through the realization that piles are loaded slowly and are contained within an ideal environment for curing.

The majority of our members do not track the CO_2e on their projects and therefore do not benchmark their total CO_2e (including scope 3) emissions. If we are to set and agree goals amongst our membership then we must do this as soon as possible.

1 What?

Derive a simple to use benchmark for embodied carbon for the main piling techniques based on a standard set of metrics.

These metrics will aim to relate carbon to a CO_2e per m^3 of concrete placed CO_2e per £ revenue of the technique and CO2 per hours worked. When data allows, this can also be related to CO_2e / kN of load carried.

Aims

1) To use these simple tools a rough guide for all low value tenders <£1.0M which can easily be worked into the various member companies estimating databases.
2) To benchmark our embodied carbon as an industry members based potentially on a further set of simplifications e.g. all mixes at a 70/30 blend for the year of 2020.
3) To thereafter allow ourselves the ability to set an improvement goal for future years e.g. by 2025 we as an industry will have reduced by xx%.

2 Why?

For all tenders over £1.0M a specific carbon calculation is to be completed and submitted with the tender in order to provide the following:

1) Increased awareness

2) The ability for the client to make a decision on how to award the contract based on price, programme and environmental sustainability

More importantly, the estimated CO_2e can be tracked as a key metric through the progress of the project. If the client were to reduce the overall loading and/or the contractor refine the design, the benefits can be summarised in terms of 2 main areas of design refinement

1) Reduction in overall concrete volume used through the structural design loads being reduced and

2) The optimization of the geotechnical design and/or technique.

Similarly the CO_2e can be tracked from tender stage through to handover through the improved utilisation of the materials themselves within the concrete and reinforcing steel.

In addition to this we need to benchmark so that we can demonstrate improvement.

3 How?

Carry out EFFC-DFI carbon calculations for standard piling construction techniques including CFA, Rotary bored and Driven pre-cast. Consider mini piling also if time allows.

Within each technique use the EFFC carbon calculator and agree on as many standard input metrics as follows:

1) Distance to concrete plant

2) Nr of piles thus time on site remains approximately the same duration

3) Standard Area/volume of reinforcement within each diameter

4) Distance travelled per operative and a common method of travel e.g. train or car

5) Standard and suitable plant size for each pile diameter / technique

Thereafter agree and adopt a standard set of concrete mix designs per technique (noting that PCC piles will have a higher cement content, most likely due to curing times required). These mix designs are to include as a minimum:

1) Standard e.g. a 50/50 opc/cement replacement blend
2) Reduced carbon mix 1 – e.g. a 40/60 blend
3) Reduced carbon mix 2 e.g. a 30/70 blend
4) A female pile mix for secant walls e.g. a 15/85 blend
5) An ultra-low carbon mix such as EFC and/or CEMFREE

Use the attached spreadsheet to agree and circulate the standard mix design characteristics to determine an example embodied carbon output for each mix design per technique.

These are to be reviewed by the working group.

In the future, this may also help smaller geotechnical contractors estimate the carbon intensity of small projects, without going through the full EFFC-DFI C calculator.

3.1 Short-term metrics

- Establish a baseline for the piling industry in terms of embodied carbon for each of the geotechnical solutions

3.2 Medium-term metrics

- Establish real-life embodied carbon for geotechnical solutions and compare this to the baseline.

3.3 Long-term best practices

- Long term target setting using the baseline established for each solution
- Produce a simplified carbon calculator, based on the task groups standardised inputs, to support small geotechnical companies in quickly calculating embodied carbon

4 Measure

These metrics will aim to relate embodied carbon per technique, per diameter to

1) Carbon to a CO_2e per m3 of concrete placed
2) CO_2e per £ revenue of the technique
3) CO_2e per hours worked.
4) when data allows this can also be related to CO_2e / kN of load carried.

Also each member is to submit the total concrete placed/poured in terms of volume in 2020 to allow baselining to take effect.

5 Key outputs

- Embodied carbon outputs per diameter, per technique, per mix design
- These metrics will aim to relate carbon to a CO2e per m3 of concrete placed Co2e per £ revenue of the technique and CO_2 per hours worked. When data allowed this can also be related to CO2e / kN of load carried.
- An FPS or FPS-EFFC webinar, setting the baseline and setting the improvement goals for improvement in the industry (after discussion and agreement with the FPS exec).