

Phase 1 Statement Theme Automation and Productivity
Statement number 2
Launch Date 23 June 2020
Closing Date for submission 03 August 2020

Title:	Extending Productive Hours for Construction Sites
Background	Noise restrictions, for workers' welfare and nuisance control, limit the operating hours on a construction site. By exploring solutions that enable remote controlled or highly automated operations of various quiet construction tasks, construction can continue within the restricted noise levels after the traditional "noisy hours". The construction site productivity can be improved without compromising worker welfare and affecting nearby users/residents.
Challenges	<ol style="list-style-type: none"> 1. There are many construction equipment and machineries that generates loud noises and also dust throughout the day such as hacking machines, concrete vibrators, electric generators, etc. Therefore, the productive hours of construction are limited to the day time to ensure nuisance is not caused to nearby neighbourhoods. 2. Working extended hours (i.e. during the night) also poses safety hazards to workers. Safety monitoring tends to be more difficult and response to emergencies are slower in comparison to day operations. 3. Continuing works after the usual hours in construction is expensive considering that the tasks are manpower-dependant hence costly. 4. Robots may be a possible solution to overcome dependency on manpower during afterhours at site. Challenges in robot deployment on site includes human safety when working with robots, the dynamic environment of construction sites, and the lack of supporting infrastructure for construction robotics. 5. The industry currently has low adoption of automated solutions due to cost and its complexity to deploy.
Desired Outcomes	<ol style="list-style-type: none"> 1. Construction site can continue to be productive afterhours while ensuring minimal noise and dust generation. 2. Increase manpower productivity by at least 100% or reduce labour reliance by 50% during afterhours work at the construction site. 3. Proposed solution is cost effective in comparison to conventional methods. 4. Ensures safety of workers during the afterhours work.
Requirements	<p><u>General requirements</u></p> <ul style="list-style-type: none"> • Solution considers safety when being deployed • Proposal quantifies improvement over conventional methods - noise reduction, manpower, productivity, cost. • Includes a construction industry partner in the team. • Solutions should be TRL 5 to 7 (i.e. must have at least a prototype tested in controlled environment) • Access to a potential trial/testbed site is a plus point.

	<p><u>Solution Specific requirements</u></p> <p>If robotic solution is proposed:</p> <ol style="list-style-type: none"> a. Robot capability should cover Sensing, Mapping, Navigation, Collision avoidance (most fit for purpose in the construction site). b. Address potential for integration with other systems (eg 3D BIM models, other common digital platforms). c. Addresses infrastructure required by robotics on the construction site (power source, communications, fleet management, etc.). d. Include operating procedures/best practises for robots. e. State the (quiet) construction task it is trying to automate. Robots should make tasks highly automated. f. Subject matter expert with relevant experience in the project team for the construction task they are trying to automate.
<p>Possible Solutions</p>	<ol style="list-style-type: none"> 1. Nuisance (noise & dust) mitigation solutions for construction. 2. Remote monitoring or digital solution to improve work safety at night. 3. Robotic solution to allow works to be conducted after hours with reduced manpower. 4. Design solutions and guidelines to enable quieter construction and/or robotics operations
<p>Development Timeframe</p>	<p>Applicants are encouraged to propose phases of development and delivery.</p> <p>Total project period shall not exceed 12 months.</p> <p>A proposed timeline is as follows:</p> <ol style="list-style-type: none"> 1. Adaption of prototype/solution to fit construction operating environment 2. Testing & validating prototype/solutions on the actual construction environment 3. Refinement & iterations
<p>Additional Info</p>	<p>Specific site visit will be arranged after award of the project due to current Covid-19 situation.</p> <p>Applicants are encouraged to team up with other solutions providers that have relevant technologies for system integration into a more holistic solution. E.g. Company specialising in 3D mapping solution can team up with company specialising in mobility solutions to come up with a semi/fully autonomous robotic 3D scanning robot. The same company may also engage the services of building professionals with the relevant construction expertise to understand the end-user requirements and expected performance specifications to ensure that the solution would meet the key functional requirements.</p>