

Request for Proposal
Obayashi Challenge2018
Toward “Obayashi Construction 4.0”

Nov. 1st, 2018

Obayashi Corporation,
Open Innovation Project Center

Note: In no event shall Obayashi Co. be liable for any special, direct, indirect, consequential, or incidental damages or any damages whatsoever, whether in an action of contract, negligence or other tort, arising out of or in connection with the use of the contents of this RFP.

1. INTRODUCTION

People over the age of 65 make up a quarter of Japan's population, and it's on track to reach 40 percent within next 30 years. The lowest fertility ratio in the world spurs on the super high aging society. In the case of the construction industry, the tendency of top-heavy demographic is more exaggerated and faster. For instance, the current survey by Federation of Construction Contractors demonstrates this by showing that one over three labor population would enter retirement within the next decade. Thus, the construction industry needs to find a way to achieve high productivity as an urgent matter.

The productivity of the construction industry has not been improved for the past several decades, exemplifying many obstacles such as labor intense project, one of kind design, different constraints for every project, and many and diversified project participants. As a matter of fact, the way of construction has almost nothing change since the machinery revolution, even though "Industry 4.0" has been gotten its popularity in other industries. The event, "Obayashi's Choice," is our ambitious to look for technologies and innovations to bring about "**Obayashi Construction 4.0.**"

※ Please note that Obayashi Construction 4.0 refers to the extent of the concept, "Industry 4.0" to the construction industry. Into the future as Industry 4.0 unfolds, computers are connected and communicate with one another to ultimately make decisions without human involvement. A combination of cyber-physical systems, the Internet of Things and the Internet of Systems make Industry 4.0 possible and the smart factory a reality. Obayashi Co. aims to apply the notion of Industry 4.0 for the construction process from design to maintenance. Highly advanced cyber-physical system can generate design, construction scheduling and planning, estimates from the archived data accumulated by the past projects of Obayashi. The generated design through AI and deep learning algorithm can be transferred into the physical building component. The collected data from sensors embedded into the building can provide rich information and feedback for next design of a smart building.

2. PROJECT DESCRIPTION/SCOPE

Obayashi Co. (OC) is specifically seeking technology solutions which can implement the Obayashi Construction 4.0 vision by addressing the following objectives and matching topic areas, such as "10X productivity improvement

across the value chain”, “Energy Efficiency 2.0”, and ” Smart City Evolution and re-design.”

- **Topic 1: BIM Based On/Off-Site Auto Manufacturing System (B2OSAMS) to achieve High Productivity Method:**

The major target of ultimate high productivity is to shorten the duration from schematic design to building completion. B2OSAMS may refer to the system which can transfer “information (Cyber)” to “physical,” along with the concept of Digital Twin. Module construction, automated fabrication system, and 3D Printing devices are primary candidate fields to realize this concept. For instance, when a client and an architect select a land, B2OSAMS may automatically generate BIM model with multiple options. After the selection and permission process, the evaluated BIM model can be transferred to materialized via BIM based on/off-site manufacturing devices.

- **Topic 2: Space utilization technology**

In addition to the space elevator project which is already under working, Obayashi Co looks for the space development related areas that the construction company's technology and know-how can be applied and used, such as lunar planet exploration and constructing facilities on the moon. To make any proposal on utilizing the technology of construction companies in the space field and utilizing space related technology for research and development of the construction would be highly welcome.

- **Topic 3: Energy Efficiency 2.0**

We have kept researching on the realization of hydrogen society and efficiently utilize unused energy including natural energy. The key technologies are how to generate, store, transfer and supply the energy efficiently and effectively. The urban area would show high demand to use the energy which may bring several constraints and challenges. The proposed idea may show the solution for this type of problems and needs.

- **Topic 4: Smart City and Re-design the city for Mobility society**

The rapidly developing autonomous vehicle technologies such as CASE and

Maas have had a large potential to change the way of infrastructure, area design, urban planning and building completely. The proposed idea may show a solution of what kind of technology and design system can be applied.

These challenges are discussed in detail in following section, “Technical Topic Area.”

3. Technical Topic Areas

Obayashi Co. is seeking technologies that address an aspect of the following technical topic area (TTA). Obayashi Co. is interested in innovation across the topic area and realizes that a single provider likely cannot fulfill all, or even a substantial portion of the desired capabilities. Respondents are encouraged to apply even if they only meet some of these goals.

3.1 TTA #1: BIM Based On/Off-Site Auto Manufacturing System (B2OSAMS) to achieve 10X Productivity Improvement Method:

Decreasing the production population pushes the construction project towards achieving ultimate high productivity, 10X productivity improvement. OC believes that the BIM based On/Off-site Auto Manufacturing System (B2OSAMS) can be the key concept to automatically make a product by transferring BIM data, enabling to shorten duration of the lead time. 3D printing technology can be one of good candidates for the concept. The devise should be used as a structural and/or façade component.

Need Statement; “*Need a way to improve the total productivity of the site construction duration for owners and construction companies, that will bring benefits of the shorten their lead time.*”

Here are the lists of factors that BIM based on/off site auto manufacturing system (B2OAMS) may consider some of meeting requirements. You do not need to consider all of constraints and requirements. Your solutions can consider one or two of these constraints and/or requirements.

- Need to have an interface with AI for design Assistant (AIDA) project. AIDA refers to the concept that, when a client or an architect choose a location of land for their facility, the system allows automatically to generate

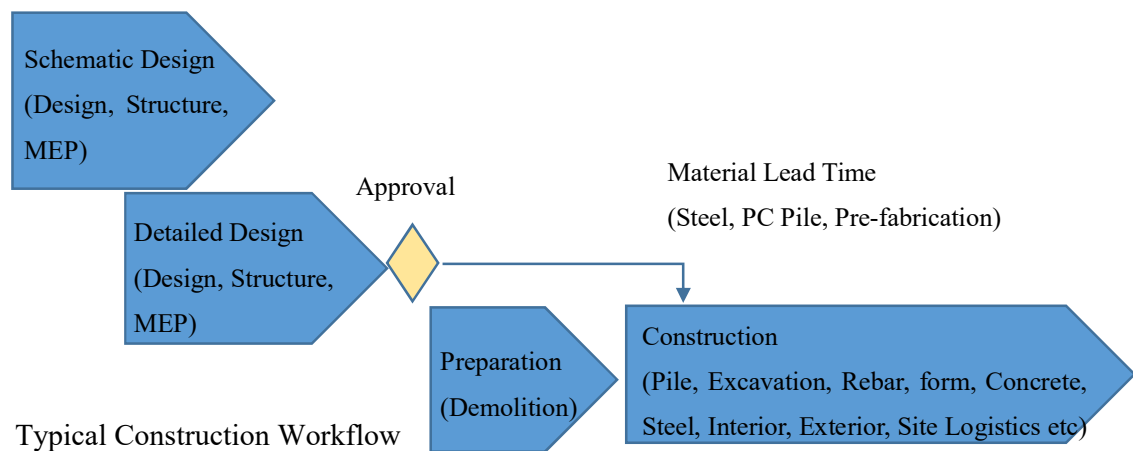
BIM model of floor, structural, and MEP planning in consideration of local codes and site restrictions. Your proposal may consider to extent the concept of AIDA toward modular construction system.

- Need to connect with the existing BIM system such as Autodesk products, which can conduct multiple analysis such as wind simulation, heat simulation, structural analysis, and ventilation analysis, supporting a part of UHPM concept.
- Need automatically to make a production of a part/a whole structural, façade, large roof of building component from BIM model.
- ※ You can presume that the perfect BIM model is available for a project. Or you can propose how your system can include to generate a perfect BIM model.
- The following pictures exemplifies a challenge against Architect freedom. Ms. Zaha Hadid is well-known famous architect as many “unbuild works.” The proposal of Tokyo Olympic stadium shown in the picture was also unbuilt and change the whole plan not only due to cost issue but also substantially impossible shape of the roof. When structural engineer analyzes, the shape of roof needed to change significantly, meaning a different feature of Architect intent. Your proposal in B2OAMS may show a solution in this type of problem. FYI, the length of the arch type roof in the proposed Tokyo stadium reaches to 370 m, bringing challenge to support itself.

<https://www.archdaily.com/879680/new-exhibition-highlights-the-best-unbuilt-works-by-zaha-hadid-architects>



- ❖ Your proposal can provide a solution of either automatically structural calculation, or new way to build the unbuildable structure with a new material.
 - Since the Zaha is just an example of the challenge, thus, your proposal can choose similar type of challenges in the construction industry such as designed staircase, arch, façade, any other which represents high potential to realize the concept of B2OAMS.
 - B2OAMS can handle materials which can be used for structural components or a part of building according to the code. For instance, steel, reinforced concrete, wood, and carbon.
- ❖ Here is the typical work flow of a construction project. You can improve the productivity for the whole duration and/or any specific activities.



- ❖ Please note that AIDA project only provides a solution of Schematic Design for Architect, not for Structural engineer and MEP engineer.
- ❖ Please note that you do not think of any logistics constraints if there is something made off-site at this point.

3.2 TTA#2, #3, and #4

- TTA#2 “Space Utilization Technology,” TTA#3 “Efficient Energy 2.0,” and TTA#4 “Smart City and Re-design the city for Mobility society” include a large range of scope. These topics are posted based on our long-term research development purposes. As OC has stated in the "Obayashi Medium-term Corporate Business Plan 2017," OC has looked for the variety of topic in order to deepen and expand the business domain, through the series of actions such as acquisition of new elemental technologies leading to the creation of business and establishment of new business model through cooperation with different industries. As one of its measures, from April 2019, we will establish a new classification called "future creation theme" from the R&D points of view.
- The future creation theme looks for seed technologies for new business domains which have a large potential to contribute to Obayashi revenue by medium-to-long term perspectives. In addition, we are considering actively implementing open innovation (including venture investment etc.)
- The fields to be started in April 2019 are (TTA#2) space utilization technology, (TTA#3) Efficient Energy 2.0, and (TTA#4) Smart city and Redesign the City for Mobility Society.
- Thus, any area of proposals would be acceptable for us to take as far as we see some potential solutions for the above fields.
- Applicants can choose one of above themes and submit your proposal. In that case, please describe your proposal is for “Future Creation Theme.”
- You can expect that audience of oral pitch will include specialist who has strong background of design, structural, MEP, construction and environmental engineering.
- If your proposal is selected as a future creation theme, the project duration and schedule is mutually discussed between OC and your organization. Thus, the schedule described in the section 4 & 5 may not be applicable for future creation theme.

4 PROJECT DELIVERABLES AND PHASES

4.1. Deliverables

Depending on technology readiness and/or approach, deliverables may range from Proof of Concept papers to fully deployable solutions. Obayashi Co. defines each of these

potential deliverables as follows:

Phase	Deliverables	Duration
1	Proof of Concept / Working Prototype (simple test environment)	Several Months after award
2	Working Prototype (simple test environment) to Working Prototype (complex test environment)	Several months after successful completion of Phase 1
3	Working Prototype (complex test environment) to Initial Production Model	Several months after successful completion of Phase 2
4	Pilot deployment and/or data acquisition	Begin after successful completion of Phase 3

- 4.2.1. **Proof of Concept**: Paper documentation inclusive of verifiable test evidence, technical drawings, software or other proof that the technical approach is sound.
- 4.2.2. **Working Prototype (Simple Test)**: Simple test prototypes can range from “breadboard” mock-ups to single test components that demonstrate working technology. An example of a simple test prototype would be a device user interface that enables basic communication with and/or control of a device in a controlled test environment.
- 4.2.3. **Working Prototype (Complex Test)**: Complex test prototypes may not be fully productized but would be able to demonstrate all features and functions of a technology and be tested in more complex environments. An example of a complex test prototype would be a device user interface that enables multi-modal communication with and/or control of a device in a mock operational environment.
- 4.2.4. **Pilot Deployment**: Technologies reaching this level would be fully completed designs and reputedly provide all proposed features and functionality. Initial production models would not need to be provided in multiple quantities.

5 GENERAL INFORMATION AND INSTRUCTIONS:

5.1 Response date:

Event	Time Due	Date or Date Due
Kickoff Event	3:00 PM PDT*	August 29, 2018
Applications Due	11:59 PM PST*	Nov. 15th, 2018
Invitation for Oral Pitches	N/A	Nov. 20th, 2018
Oral Pitch	8:30 AM PST*	Dec. 4 th , 2018
Notification of Application Evaluation Results	N/A	Jan. 31 st , 2019
Closing Date	11:59 PM PST*	March 31 st , 2019

- ※ Pacific Day Time (PDT), Pacific Standard Time (PST)
- ※ Applicants can submit their application multiple times right after the kickoff meeting until due date of submit. Applicants can start discussing about needs and pains with Obayashi team members even though earlier than the due date.

Exhibit A: Application Instruction

1. General Instructions

- 1.1. This solicitation includes a requirement to submit proposals (heretofore “applications”), subject to the date identified in the “Response Dates” table above, which will be reviewed by Obayashi Co. and may result in an offeror (heretofore “applicant”) receiving a request to provide a twenty to thirty minute (from 20 **to 30**) oral presentation (heretofore “pitch”).
- 1.2. Written applications as described in 4.3 must be received in the following e-mail box by the closing date and time of this announcement: Dr. Takashi Tsuchiya <tsuchiya.takashi@obayashi.co.jp>. Applicants will receive a reply to the application email acknowledging receipt. Pitches will be entertained by invitation based on applications and are the final evaluation before potential award. Invitations for oral pitches will be planned on **December 4th, 2018.**
- 1.3. Obayashi Co. reserves the right to select for award and to fund all, some, parts, or none of the applications received in response to this solicitation.
- 1.4. Any information shared with Obayashi Co will be treated as non-confidential and any effort put into the application won’t be reimbursed.
- 1.5. In no event shall Obayashi Co. be liable for any special, direct, indirect, consequential, or incidental damages or any damages whatsoever, whether in an action of contract, negligence or other tort, arising out of or in connection with the use of the contents of this RFP.

2. Application Requirements

- 2.1.1. To be considered for award, offerors **MUST** do the following:
 - Submit a written document in Adobe PDF format including the architectural Intellectual Property diagram. The total number of pages including the application and diagram may not exceed 10 pages. Applications must describe the work proposed and answer for written in section 2.1.2. Applications should also provide an overview/strategy for the overall effort to commercialize proposed products. Please note that only content contained in the application will be considered during the review process. No other documents, videos or links to information will be considered. Offerors should be alert for any amendments and changes to this solicitation.
 - Notify a user account and register their company in [website] – This

does not need to be done at the application phase but must be done if the applicant is chosen to pitch and provides a successful pitch. The successful applicant must have a registered [website] account in order to be awarded.

- Applications must be compliant with the aforementioned response dates and other compliance requirements in accordance with good manner. Submissions not in compliance will be rejected.
- There are two steps to select partners for co-developing R&D project. The first step is that selected applicants conduct a short presentation in the beginning of December. After the presentation, as the second step, Obayashi Co. will conduct rolling reviews and anticipate that reviews will be completed within the proper duration after the presentation.

2.1.2. Written applications should answer or address the following:

- a. Describe your technology, how it works, and its potential relevance to the problem outlined.
- b. In what ways, does it push the state-of-the-art? What is innovative or novel about your technology as compared to other solutions?
- c. Describe the maturity of the working prototype? ^[]_{SEP}
- d. How would you apply co-developing from Obayashi Co. to adapt your product to a use case(s) as described in the RFP call? ^[]_{SEP}
- e. What milestone achievement throughout the course of a three-to-one year co-development period should be used to trigger payment of the Obayashi Co. investment? ^[]_{SEP}
- f. How much the project costs? Obayashi is planning to fund projects depending on the project scope and technology level.
- g. What level of outside investment has your company received? From whom? ^[]_{SEP}
- h. What is your annualized run-rate based on your current weekly/monthly revenue? What is your current monthly burn rate? What is your month-over-month revenue growth rate (USD)? How much revenue did you book in past 12 months? ^[]_{SEP}
- i. Are you cash flow positive? ^[]_{SEP}
- j. How many active customers or users do you currently have? ^[]_{SEP}
- k. Describe your company – How old is it? Where is it located (e.g.

multiple locations, sales/R&D in U.S. and other countries)? Number of employees?

1. Describe the management team – Who are they? What is their background and history (e.g. previous startups, etc)? Qualifications of the key project personnel?

2.1.3. The evaluation criteria published in our URL, [<https://svvl-construction.com/>], will be applied to the application evaluation process, and specific to this call, applications will be reviewed for:

- Ability to help Obayashi Co. operational missions or critical infrastructure facilities;
- Ability of the device technology to operate in diverse and demanding weather conditions;
- Durability and expected longevity of the technology;
- Overall implementation costs, including maintenance costs.
- Training requirements for operation and maintenance;
- Ability to interoperate with and/or supplement capabilities of other devices
- Ability to adapt to potential future technical environments, protocols, and standards;
- Financial soundness of the company, and the business model based on the technology to be supported;
- The scalability and cost-effectiveness of the proposed technology or solution;
- Existing relationships with relevant entities within the industry;
- Access to product distribution channels;
- Company and/or personnel experience in the industry or security sectors applicable to the device environments in which the technology will be deployed.

2.2. Application Format

There is no formal format, Applicants can submit Power Point

2.3. Pitch Format and Requirements

Applicants invited to present pitches will be limited to twenty (20) minutes for their oral presentations. In addition, applicants making pitches may

provide up to ten (15) slides for presentation in either Microsoft PowerPoint or Microsoft Word document. ^[11]_[SEP]

2.4. Contact and Inquiries

All contractual or technical inquiries to this solicitation must be emailed via the following URL <<https://svvl-construction.com/>>. Emails submitting questions are to include “**Q about Obayashi Challenge**” in the subject line. Questions will only be accepted and answered electronically.

URL Website: <https://svvl-construction.com/>

Obayashi Silicon Valley Ventures & Laboratory (SVVL) Office:
Address: 951 Industrial Road, Suite C, San Carlos, CA 94070

Staff:

Dr. Tamaki Horii, GM of OIPT

Mr. Hiroto SATO, VP of SVVL

Dr. Takashi Tsuchiya, Development Manager of SVVL