

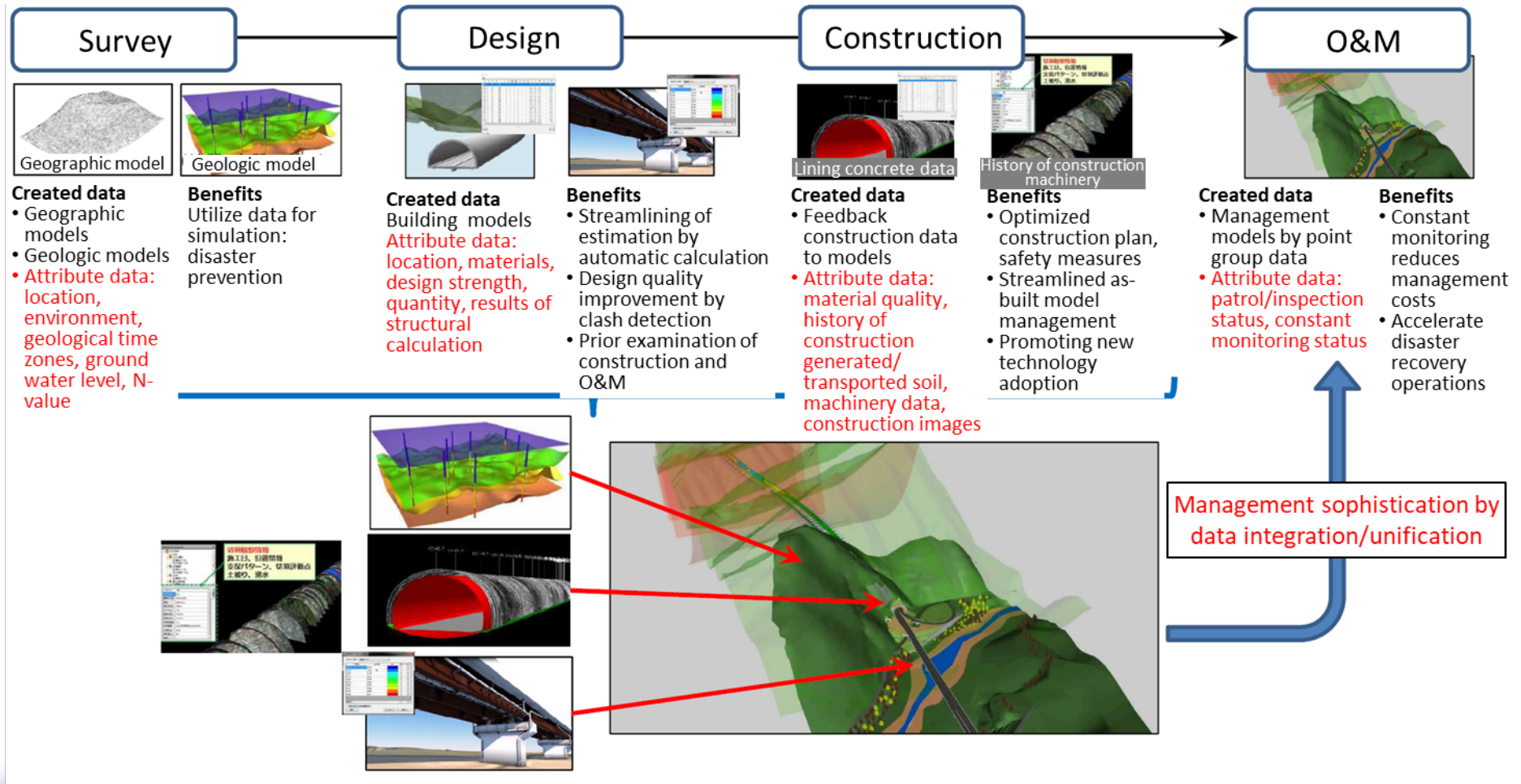


Application of BIM/CIM to Sewerage Facilities: Trial Results

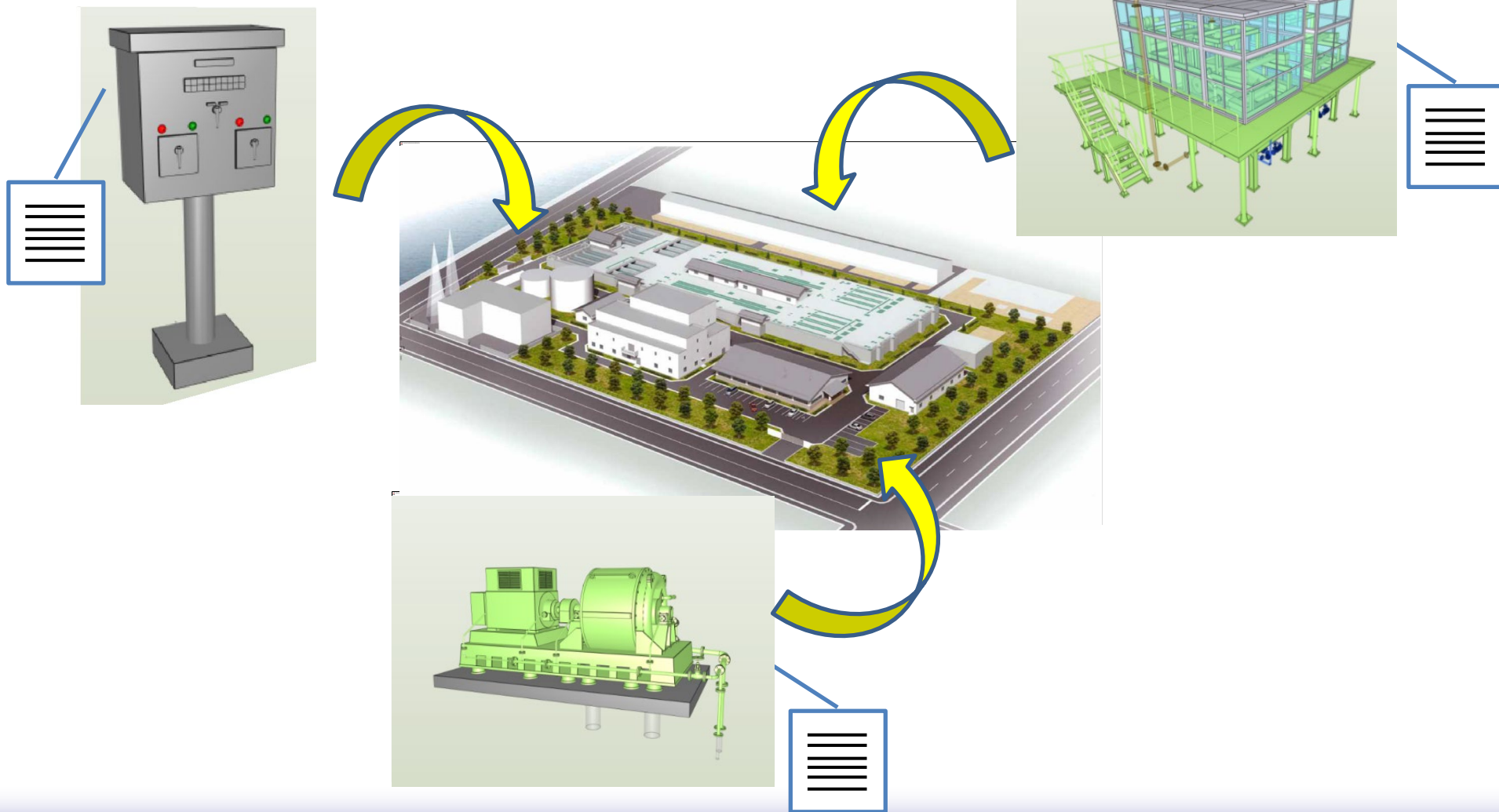
Japan Sewage Works Agency (JS)

Yoshitada INOUE

BIM (Building Information modeling/CIM (Construction Information Modeling/Management) is a process adopting a 3D model from the early phase of construction projects: plan/survey/design. The subsequent processes including construction and O&M utilize enhanced BIMs/CIMs (Models). Information sharing of the entire project between stakeholders streamlines and sophisticates a construction production system for a contractor and a contractee.

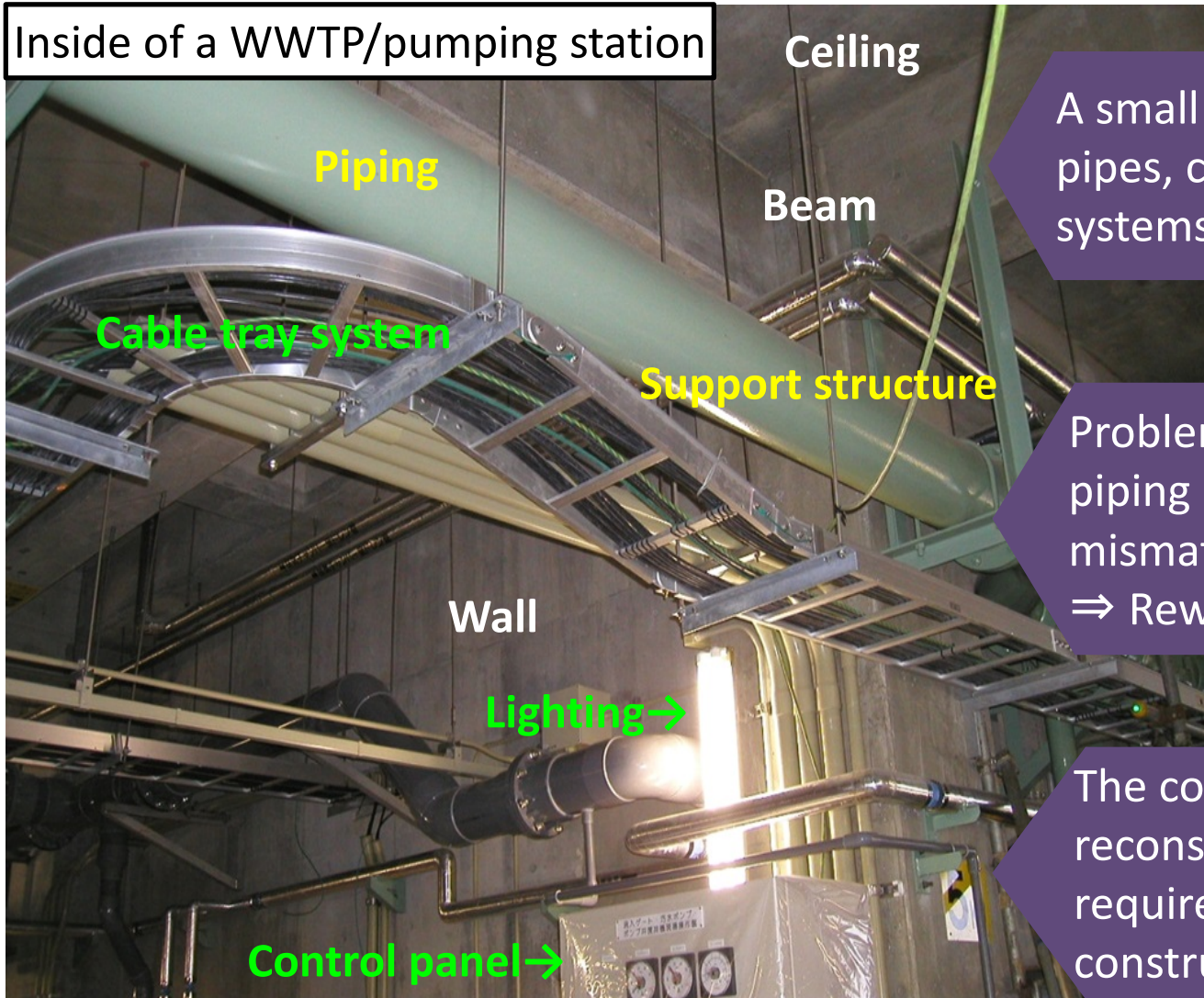


BIM tags are attribute information, and blocks are construction bodies and facilities. In 3D modeling, combine blocks to create three-dimensional models with similar shapes and properties to actual bodies.



Benefits of BIM/CIM for Sewerage

*Reference: MLIT



Inside of a WWTP/pumping station

Ceiling

Piping

Beam

Cable tray system

Support structure

Wall

Lighting →

Control panel →

A small space is complicated by pipes, cables, and cable tray systems.

Problem such as interference of piping and cables, and mismatched location of box-out ⇒ Rework/return

The coming of severe reconstruction/retrofitting era requires adaptable design, construction and O&M.

BIM/CIM, 3D models, are effectual in such a place



Benefits of BIM/CIM for Sewerage

| Example of adoption | Phase | Benefits |
|---------------------------------------|-------------------------|--|
| ① Data visualization | Design | <ul style="list-style-type: none">▪ Can image a completed shape▪ Accelerate consensus building▪ Facilitate layout plan, landscape assessment and image of conducting wires▪ Confirm piping and maintainability easily▪ No various kinds of drawings are required▪ No adjustment between many drawings is required |
| ② Interference pre-screening | Design/ Construction | <ul style="list-style-type: none">▪ Can confirm the consistency from an arbitrary point of view |
| ③ Optimization of construction plan | Construction | <ul style="list-style-type: none">▪ Modeling of temporary scaffolding→ Enables safety improvement by information sharing of dangerous places→ Enables optimization of construction by data sharing of work contents, procedure and areas▪ Enable temporary planning for facilities in operation to speed up construction work |
| ④ Rapid development of plant register | O&M | <ul style="list-style-type: none">▪ Utilize input data of BIM/CIM to create plant register |
| ⑤ Prevention of dispersing field data | O&M | Recording the retrofit/repair of only 3D models streamlines the drawing development for the next construction project |

【The past attempt】

- 2017-18: Consider trial use at the detail design and construction work for the extension and retrofit
- May 2019: publish CIM Introduction Guidelines for Sewerage (draft)



- Few clients utilize the Guidelines
- Not utilized because of software compatibility's problems
- Introduced and utilized at rivers or roads project

【Attempt in 2019】

- Figure out the utilization status of BIM/CIM by questionnaire
- Create quantity calculation sheets
- Create drawing at design work
- Share information between contractor and contractee



Questionnaire about Utilization Status of BIM/CIM

【Scope】

- Design: Members of Association of Water and Sewage Works Consultants Japan
- Construction (machinery): Members of Japan Sewage Treatment Plant Constructors Association(JSCA)
- Construction (civil engineering): contractors of civil engineering works , which have contracted 3.5 hundred million yen and over for JS projects

【Response rate】

- Association of Water and Sewage Works Consultants Japan: 39.7% (46/116)
- JSCA: 100% (39/39)
- Civil engineering works contractors: 69.6% (16/23)

【Questions】

- | | |
|--|--|
| ① How to manage BI M/CIM | ⑦ Creator of models |
| ② Kind of owned software | ⑧ Benefits and issues of BIM/CIM utilization |
| ③ Period of usage | ⑨ System development status of cooperative companies |
| ④ Utilization rate of BIM/CIM in operation | ⑩ Things required to promote BIM/CIM utilization |
| ⑤ Summary of the project | ⑪ Data needed to streamline operations |
| ⑥ Purpose of BIM/CIM utilization | |

- BIM/CIM utilization at the design phase or by contractors is a future issue
- Japan Sewage Treatment Plant Constructors Association(JSCA), a group of machinery contractors, is more advanced than the design contractors. Still, their BIM/CIM utilization is about one-third of the whole project.

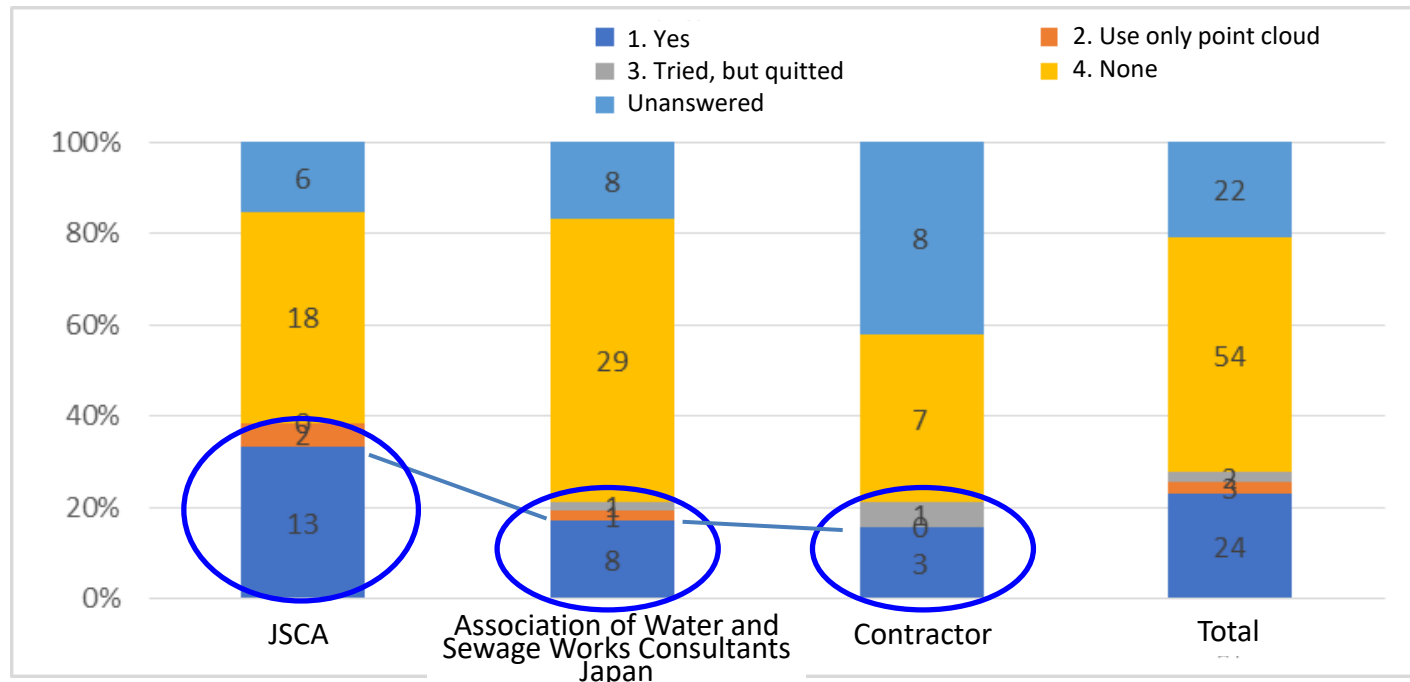


Figure: Attempt status of BIM/CIM

Modeling of civil engineering or construction work, such as reinforcement, is very demanding. So BIM/CIM will be introduced to machinery works first.

Issues extracted from the field survey

① Costs

- Software is expensive
- No benefit at the design phase
- No financial support for software and human resource development

② Human Resource Development

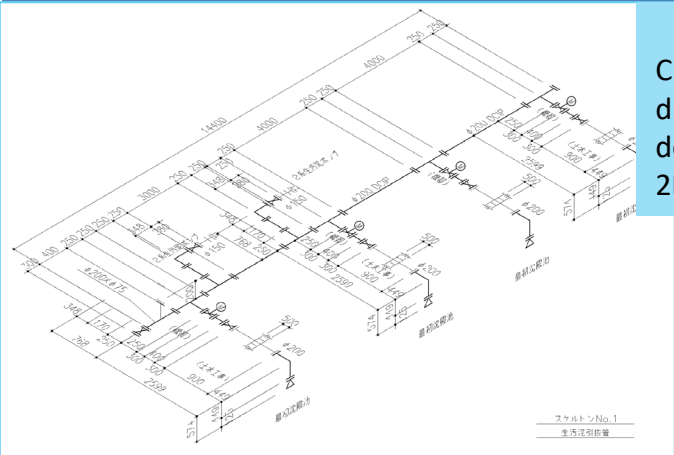
- Can not raise HRD cost
- Can not secure human resource. System development is difficult.
- Few opportunities for utilization makes training program intermittent, and skills do not stay

③ 3D materials relating to the existing 3D data and facilities specialized to sewerage

- No BIM/CIM modeling of the existing facilities
- In sewerage business focusing on retrofitting projects, modeling is intricate because retrofitting is out of design scope
- Inefficient BIM/CIM modeling because no 3D materials specialized to sewerage

Trial quantity calculation of machinery works at 7 WWTPs

2D quantity calculation



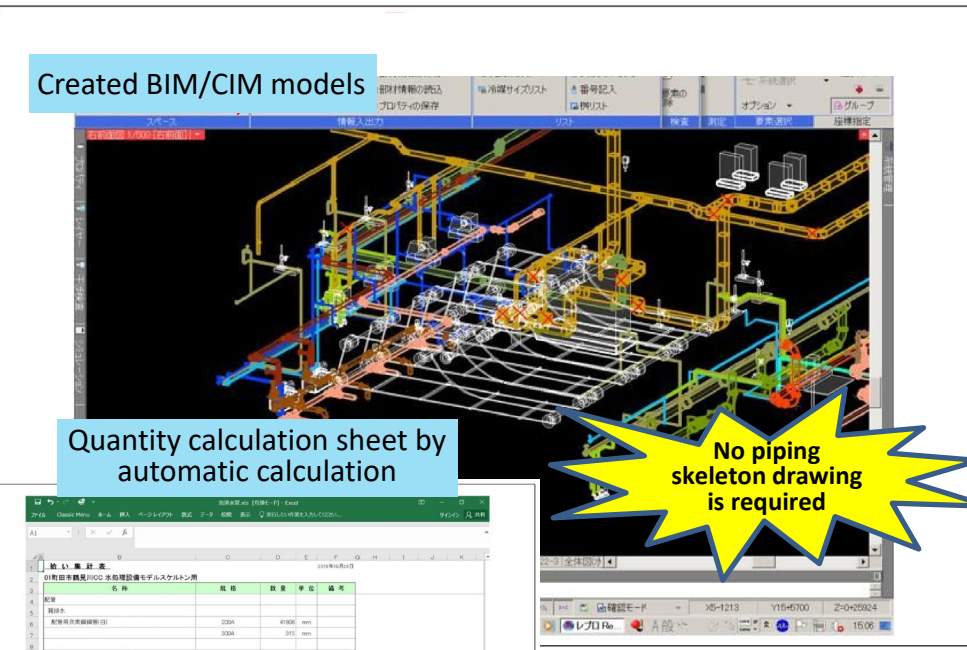
【Step 1】
Create Skeleton drawing based on design drawing using 2D-CAD



【Step 2】
Based on skeleton drawing, create quantity calculation sheet by manual input into spreadsheet software

| 鉄管 (φS80以下) | | 弁・継手類 | | | 塗装・被覆 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------|---------|---|--------|--------|--------|----|-------|----|--|-------|--|--|--|--|--|--|----|----|----|-----|------|-------|--------|----|------|-----|-----|---------|-----|--|-------|-----|----|-------|--|--|--|--|--|-------|------|----|-------|------|-----|---------|--------------------------|-------|--------|------|----|-------|------|-------|---------|---|---|-------|------|----|-------|------|-----|---------|---------------------------------|--------|--|--|--|--|------|-------|---------|----|----|--|--|--|--|------|-----|---------|--------------------------|-------|--|--|--|--|------|-------|---------|---|---|--|--|--|--|------|------|----|-------|--|-------|--|--|--|------|------|----|--|-------|--|--|--|--|------|------|----|---|--------|--|--|--|--|------|------|----|--------------------------|-------|--|--|--|--|
| NO | 管名称 | 口径 | 長分 | 単価名称 | 長さ(m) | 種類(口径) | 区分 | 単価面積 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 生肉配管 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th colspan="2">配管</th> <th colspan="7">塗装・被覆</th> </tr> <tr> <th>口径</th> <th>種類</th> <th>長分</th> <th>計算式</th> <th>計算結果</th> <th>長さ(m)</th> <th>種類(口径)</th> <th>区分</th> <th>単価面積</th> </tr> </thead> <tbody> <tr> <td>φ75</td> <td>配管長</td> <td>管内露出・標準</td> <td>0.2</td> <td></td> <td>0.200</td> <td>φ75</td> <td>露出</td> <td>0.236</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2.792</td> <td>φ150</td> <td>露出</td> <td>0.471</td> </tr> <tr> <td>φ150</td> <td>配管長</td> <td>管内露出・標準</td> <td>$(0.218+0.348) \times 2$</td> <td>2.232</td> <td>18.500</td> <td>φ200</td> <td>露出</td> <td>0.628</td> </tr> <tr> <td>φ150</td> <td>異形管接続</td> <td>管内露出・標準</td> <td>4</td> <td>4</td> <td>4.992</td> <td>φ200</td> <td>水中</td> <td>0.628</td> </tr> <tr> <td>φ200</td> <td>配管長</td> <td>管内露出・標準</td> <td>$(0.410+0.251) \times 4 + 14.4$</td> <td>17.004</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ200</td> <td>異形管接続</td> <td>管内露出・標準</td> <td>13</td> <td>13</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ200</td> <td>配管長</td> <td>水中露出・標準</td> <td>$(0.449+0.374) \times 4$</td> <td>4.992</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ200</td> <td>異形管接続</td> <td>水中露出・標準</td> <td>8</td> <td>8</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ100</td> <td>塗渡長さ</td> <td>露出</td> <td>0.200</td> <td></td> <td>0.200</td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ150</td> <td>塗渡長さ</td> <td>露出</td> <td>$(0.188+0.348) \times 2 + 0.28 \times 2$</td> <td>2.792</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ200</td> <td>塗渡長さ</td> <td>露出</td> <td>$(0.410+0.251) \times 4 + 14.4 + 0.34 \times 8$</td> <td>18.500</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>φ200</td> <td>塗渡長さ</td> <td>水中</td> <td>$(0.449+0.374) \times 4$</td> <td>4.992</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | | | | | | 配管 | | 塗装・被覆 | | | | | | | 口径 | 種類 | 長分 | 計算式 | 計算結果 | 長さ(m) | 種類(口径) | 区分 | 単価面積 | φ75 | 配管長 | 管内露出・標準 | 0.2 | | 0.200 | φ75 | 露出 | 0.236 | | | | | | 2.792 | φ150 | 露出 | 0.471 | φ150 | 配管長 | 管内露出・標準 | $(0.218+0.348) \times 2$ | 2.232 | 18.500 | φ200 | 露出 | 0.628 | φ150 | 異形管接続 | 管内露出・標準 | 4 | 4 | 4.992 | φ200 | 水中 | 0.628 | φ200 | 配管長 | 管内露出・標準 | $(0.410+0.251) \times 4 + 14.4$ | 17.004 | | | | | φ200 | 異形管接続 | 管内露出・標準 | 13 | 13 | | | | | φ200 | 配管長 | 水中露出・標準 | $(0.449+0.374) \times 4$ | 4.992 | | | | | φ200 | 異形管接続 | 水中露出・標準 | 8 | 8 | | | | | φ100 | 塗渡長さ | 露出 | 0.200 | | 0.200 | | | | φ150 | 塗渡長さ | 露出 | $(0.188+0.348) \times 2 + 0.28 \times 2$ | 2.792 | | | | | φ200 | 塗渡長さ | 露出 | $(0.410+0.251) \times 4 + 14.4 + 0.34 \times 8$ | 18.500 | | | | | φ200 | 塗渡長さ | 水中 | $(0.449+0.374) \times 4$ | 4.992 | | | | |
| 配管 | | 塗装・被覆 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 口径 | 種類 | 長分 | 計算式 | 計算結果 | 長さ(m) | 種類(口径) | 区分 | 単価面積 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | 2.792 | φ150 | 露出 | 0.471 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ150 | 配管長 | 管内露出・標準 | $(0.218+0.348) \times 2$ | 2.232 | 18.500 | φ200 | 露出 | 0.628 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ150 | 異形管接続 | 管内露出・標準 | 4 | 4 | 4.992 | φ200 | 水中 | 0.628 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| φ200 | 異形管接続 | 管内露出・標準 | 13 | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ200 | 配管長 | 水中露出・標準 | $(0.449+0.374) \times 4$ | 4.992 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ200 | 異形管接続 | 水中露出・標準 | 8 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ100 | 塗渡長さ | 露出 | 0.200 | | 0.200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ150 | 塗渡長さ | 露出 | $(0.188+0.348) \times 2 + 0.28 \times 2$ | 2.792 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ200 | 塗渡長さ | 露出 | $(0.410+0.251) \times 4 + 14.4 + 0.34 \times 8$ | 18.500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| φ200 | 塗渡長さ | 水中 | $(0.449+0.374) \times 4$ | 4.992 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Quantity calculation at BIM/CIM



Created BIM/CIM models

Quantity calculation sheet by automatic calculation

No piping skeleton drawing is required

【Step 1】

- Select piping on the model
- Select quantity survey
- Automatic calculation of quantity

Auto-sum by Rebro

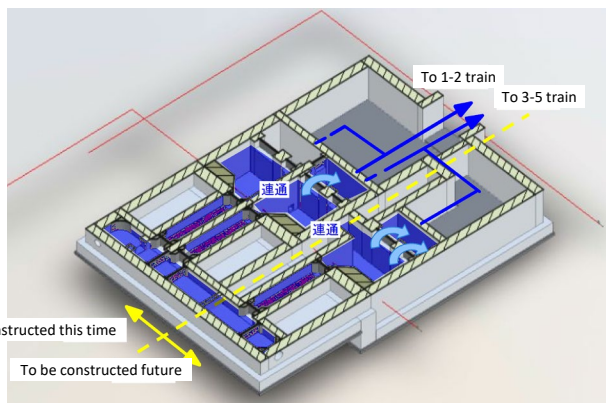
| Materials to be totalized | Standards | Skeleton | Rebro |
|---------------------------|-----------|----------|---------|
| Ductile iron pipe | φ150 | 47.95m | 48.05m |
| Ductile iron pipe | φ200 | 19.5m | 19.025m |
| Valves | | 4 | 4 |

Difference between auto-sum using 3D software and the conventional calculation

| Materials for totalizing | Auto-sum possibility | Notes for 3D software |
|--------------------------------------|----------------------|--|
| Piping: length and weight | Yes | Piping bore has a restriction. Accurate calculations need quantity surveys from the drawing development phase. |
| Valves: No. of pcs | Yes | Valve bore has a restriction. |
| Equipment, foundation: volume, frame | Yes and no | Volume can be calculated by using other software. Molding boxes can be totalized from the saved property. |
| Copper processed materials: weight | Yes | Volume totalizing is possible. Materials have restrictions. |

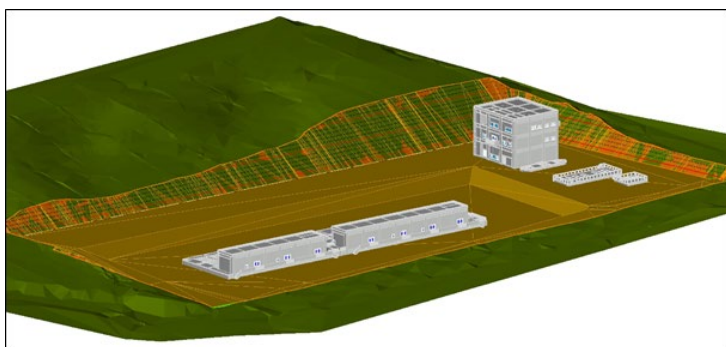
BIM/CIM requires no piping skeleton drawings for quantity surveys. Using BIM/CIM is more likely efficient for quantity surveys at estimation than conventional manners. But, when 3D materials are not registered, some restrictions might occur for quantity surveys.

Utilize BIM/CIM for detail design at WWTTPs

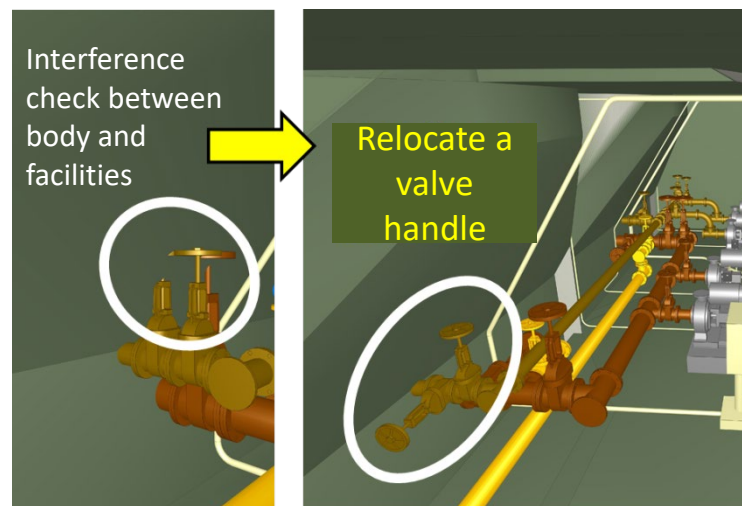


- 3D models enhance the image integration among stakeholders
- Promote interference/consistency check among different types of work

Function of distribution after a settling tank



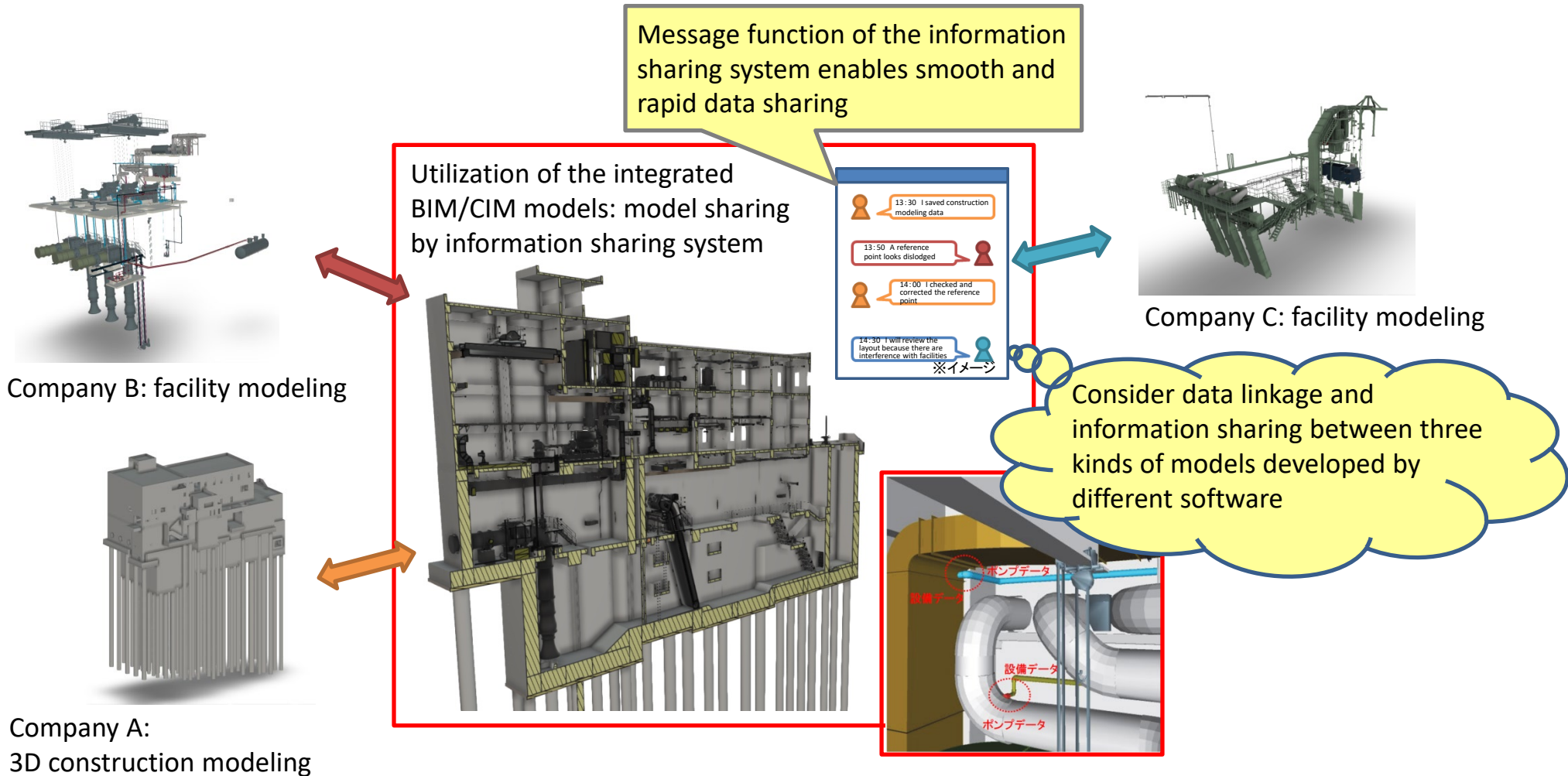
Facilities layout image



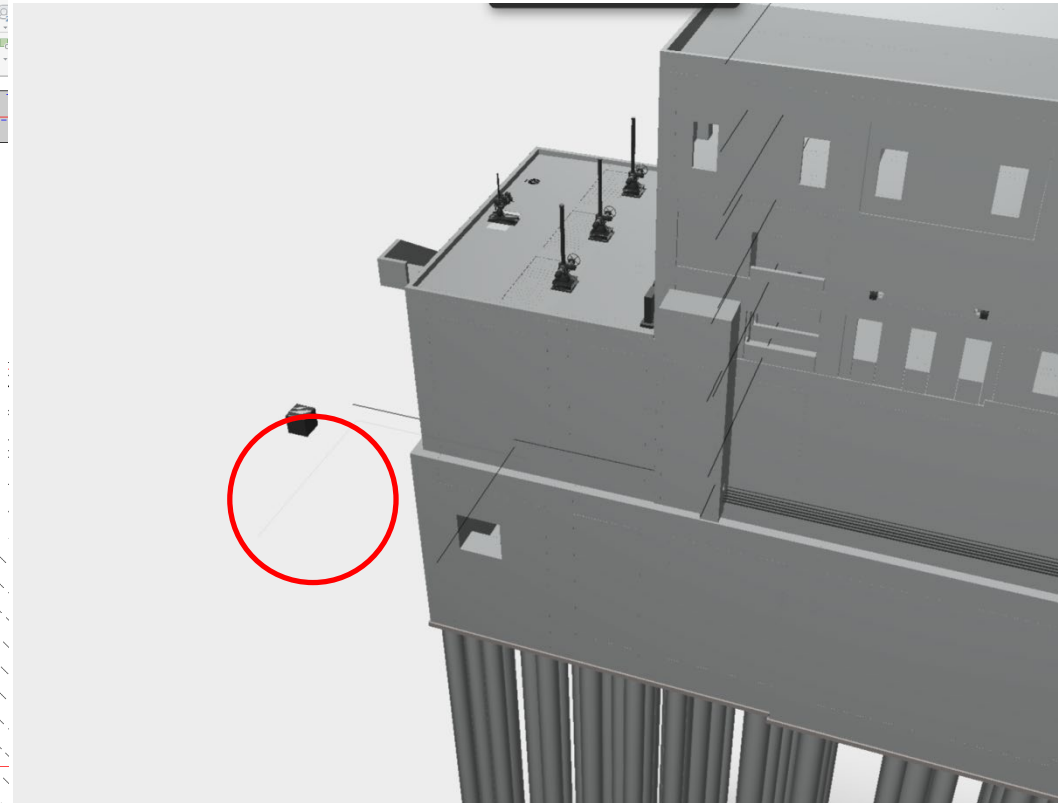
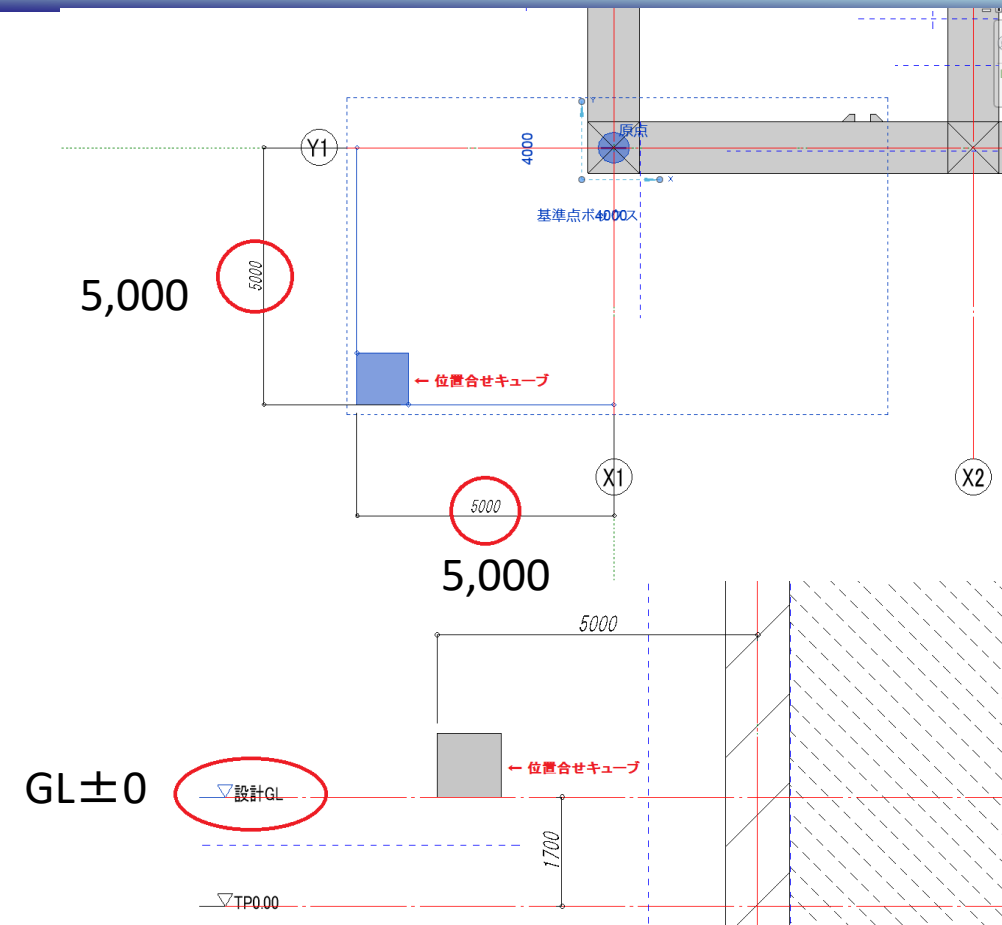
Interference check

BIM/CIM is expected to enable image integration among stakeholders, visualize adjusting points by interference check as a software's function, streamline decision-making, and prevent rework at detail design. On the other hand, some construction bodies have missing data, so data checking/revision manner among different works should be organized.

Information sharing using BIM/CIM at pumping stations



Information Sharing between Contractor and Contractee



Original positioning cube


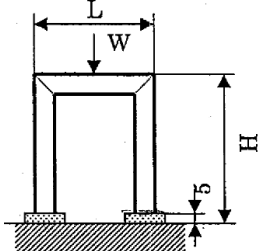
There are some issues, such as the reproducibility of attribute information due to software compatibility. The data linkage rules, including the establishment of common marks (reference points) for model integration, enabled us to examine the data using the integrated data and expected to be effective in inter-professional coordination at the operational level. On the other hand, some attribute information could not be transferred from the original model to the shared model.

Things required to promote BIM/CIM utilization at WWTPs

- ① Enhance 3D materials specialized for sewerage facilities
- ② Develop BIM/CIM modeling rules for the initial phase of its introduction

Machinery: Piping support

3D部品属性機要書

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------|---|---------|----|----|------|----|----|----|---------|---------|--------|---------|---|---|----|-------|--|--|--|--|--------|-----|--|--|--|--|--------|-------------|--|--|--|--|----|--|--|--|--|--|
| ※ファイル名 | - | ※承認 | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ※コード | - | ※作成日 | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| サムネイル1 | | サムネイル2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <tr> <td>品名</td> <td>品番</td> <td>メーカー</td> <td>規格</td> <td>単位</td> <td>在庫</td> </tr> <tr> <td>門形支持架台②</td> <td>M14-200</td> <td>〇〇株式会社</td> <td>M14-200</td> <td>個</td> <td>0</td> </tr> <tr> <td>材質</td> <td>SS400</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>重量(kg)</td> <td>2.0</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>寸法(mm)</td> <td>140×140×200</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>備考</td> <td colspan="5"></td> </tr> </table> | | | | 品名 | 品番 | メーカー | 規格 | 単位 | 在庫 | 門形支持架台② | M14-200 | 〇〇株式会社 | M14-200 | 個 | 0 | 材質 | SS400 | | | | | 重量(kg) | 2.0 | | | | | 寸法(mm) | 140×140×200 | | | | | 備考 | | | | | |
| 品名 | 品番 | メーカー | 規格 | 単位 | 在庫 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 門形支持架台② | M14-200 | 〇〇株式会社 | M14-200 | 個 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 材質 | SS400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 重量(kg) | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 寸法(mm) | 140×140×200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 備考 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 必要度 | フェーズ | 解説 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ※必須 | | 一般名称 | 門形支持架台② | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ファイル形式・Ver, | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | メーカー名 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 型番 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ※基本 | | 性能(カタログURL等) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | LOD | 200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 認定の有無 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 任意 | 製作 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 設計 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 施工 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 維持管理 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Enhance 3D material libraries

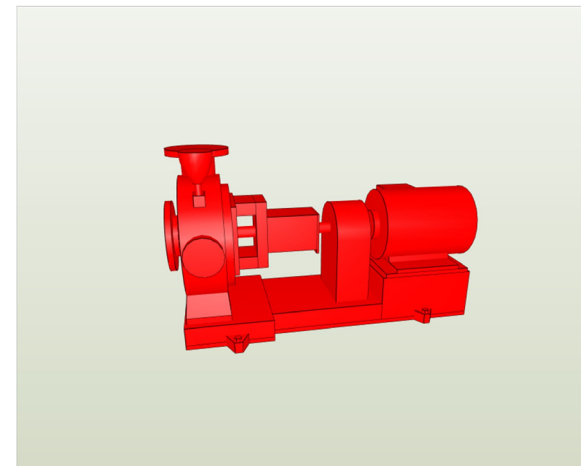
1) 流入ゲート
3D イメージ図



プロパティ

| | |
|---------|------------|
| 機器名称 | 終沈流入ゲート |
| 形式 | 鑄鉄製角形ゲート |
| 仕様 1 | 500W×600ST |
| 仕様 2 | |
| メーカー | 〇〇株式会社 |
| 設備重量 | |
| 安全管理区分 | 事後保全 |
| 大分類 | 付帯設備 |
| 中分類 | ゲート設備 |
| 小分類 | 流入ゲート |
| 標準的耐用年数 | 25 年 |
| 保全区分 | |

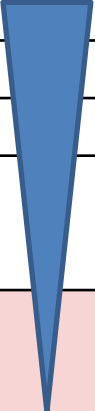
4) 汚泥ポンプ
3D イメージ図



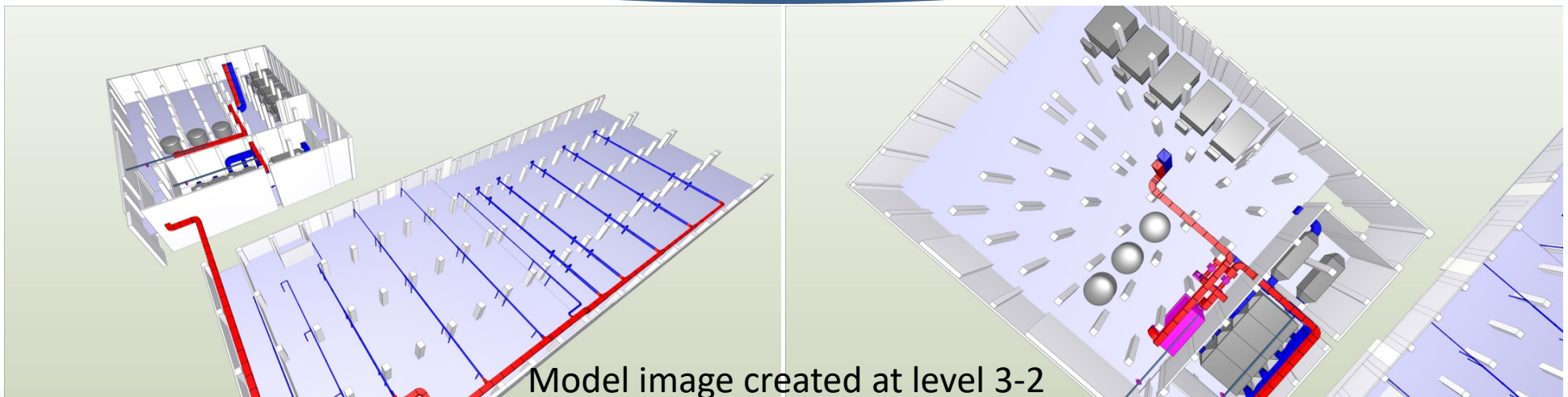
プロパティ

| | |
|---------|--------------------------------|
| 機器名称 | 生汚泥ポンプ |
| 形式 | 吸込スクリー付汚泥ポンプ |
| 仕様 1 | φ150×2.0m ³ /min×5m |
| 仕様 2 | 3.7kW |
| メーカー | 〇〇株式会社 |
| 設備重量 | |
| 安全管理区分 | |
| 大分類 | 水処理設備 |
| 中分類 | 最終沈殿池設備 |
| 小分類 | 汚泥ポンプ |
| 標準的耐用年数 | 15 年 |
| 保全区分 | 事後保全 |

Levels of BIM/CIM modeling for facility design of WWTP

| Modeling level | Work unit | Frame (Not to be designed) | Construction facilities (Not to be designed) | Plant facilities: scope of design/work type | |
|------------------|---|--|---|--|-------------------------|
| | | | | Existing facilities | This trial's facilities |
| Level 1: high |  | Transition to BIM/CIM | Transition to BIM/CIM | Transition to BIM/CIM | Transition to BIM/CIM |
| Level 2: medium | | Transition to BIM/CIM | Point cloud | Point cloud | Transition to BIM/CIM |
| Level 3-1: low 1 | | Point cloud | Use point clouds only for the adjacent area to the plant facilities | Use point clouds only for the connection areas to the existing facilities | Transition to BIM/CIM |
| Level 3-2: low 2 | | Transition to BIM/CIM only for walls, columns and floors in the scope of facility design | Not applicable | Transition to BIM/CIM only for the connection areas to the existing facilities | Transition to BIM/CIM |

In the early stages of implementation, define the scope of the design clearly. Don't overwork the model.





Thank you for your attention