

CONSTRUCTION MANAGEMENT SYSTEM AND CONSTRUCTION-DRAWING CREATING METHOD

FIELD OF THE INVENTION

5 [0001] [Related Applications]

This application claims priority to Japanese Patent Application No. 2023-121156 entitled "CONSTRUCTION MANAGEMENT SYSTEM AND CONSTRUCTION-DRAWING CREATING METHOD" filed on July 25, 2023, the disclosure of which is incorporated herein by reference in its entirety.

10 The present technology relates to a construction management system and a method for creating a construction-drawing.

BACKGROUND

[0002] As a background art of the present technical field, there is a patent publication of
15 Japanese Patent No. 7195681 (Patent Document 1). This publication describes "a reinforcing-bar-delivery support system 60 to be used for delivering reinforcing-bars to a construction site (construction part 14) where the reinforcing bars are used for constructing a building, the system 60 is configured to generate reinforcing-bar-production information relating to processing of the reinforcing-bars from a reinforcing-bar arrangement drawing indicating the arrangement of the
20 reinforcing bars, to process, based on the reinforcing-bar-production information, the reinforcing-bars which are necessary for a plurality of construction periods determined in a stepwise manner in the construction schedule, and to deliver the processed reinforcing-bars in the construction site. The reinforcing-bar-delivery support system 60 includes a data supply part 12, a processing part 16 for processing the reinforcing-bars based on the reinforcing-bar-production information
25 supplied from the data supply part 12, and a construction part 14 to which the reinforcing-bars which have been processed by the processing part 16 are delivered" (see summary).

PRIOR ART DOCUMENTS

[0003] [Patent Document 1]: Japanese Patent No. 7195681
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SUMMARY OF THE INVENTION

[Problem to be solved by the invention]

[0004] The patent document 1 describes that it is possible to create a reinforcing-bar arrangement drawing based on information included in BIM three-dimensional models. This
35 reinforcing-bar arrangement drawing is a figure indicating the arrangement of reinforcing-bars, and is created by a design company at the time of structural design, which is a design stage, for a building constructed of reinforced concrete.

[0005] On the other hand, in the Patent Document 1, creating, from three-dimensional models,

drawings which include detailed information at the construction level (for example, a construction-drawing, a processing drawing, an assembly drawing, and the like; hereinafter, these drawings may be collectively referred to as a construction-drawing for equipment), not as drawings at the design level (for example, a basic design drawing), is not described.

Therefore, the present technique provides a system for creating a construction-drawing based on BIM data.

[Means for solving the problem]

[0006] In order to solve the above-mentioned problems, for example, the configurations described in the claims can be adopted.

The present application includes a plurality of means for solving the above-mentioned problems, and for example, there is provided a construction management system for building. The construction management system for building includes: an acquisition part configured to acquire BIM data including information on a building and its constituent members; a selection-reception part configured to receive a selection of a first constituent member from among the constituent members; a model-information-generation part configured to generate, based on information on the first constituent member, model information for construction-drawing, wherein the model information for construction-drawing is required to draw or render a model for construction-drawing, which is a three-dimensional model for creating a construction-drawing; and an output part configured to output the generated model information for construction-drawing.

[Effects of the Invention]

[0007] According to the present technique, it is possible to create a construction-drawing based on BIM data.

Problems, configurations, and effects other than those described above will be apparent from the following descriptions of embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is an example of an overall configuration of a construction management system 100.

FIG. 2 is an example of a hardware configuration of a management server 101.

FIG. 3 is an example of a hardware configuration of a user terminal 102.

FIG. 4 is an example of project information 400.

FIG. 5 is an example of fixture information (equipment information) 500.

FIG. 6 is an example of parameter information 600.

FIG. 7 is an example of command setting information 700.

FIG. 8 is an example of standard model information 800.

FIG. 9 is an example of code information 900.

FIG. 10 is an example of a flow 1000 for creating a construction-drawing for fixture.

FIG. 11 is an example of a flow 1100 for associating components.

FIG. 12 is an example of a flow 1200 for generating model information for construction-drawing.

FIG. 13 is an example of a flow 1300 for acquiring constituent-member-specification information.

FIG. 14 is an example of a flow 1400 for outputting a construction-drawing for fixture.

FIG. 15 is an example of a construction-drawing-information screen 1500.

5 FIG. 16 is another example of a construction-drawing-information screen 1600.

FIG. 17 is another example of a construction-drawing-information screen 1700.

FIG. 18 is another example of an estimated item screen 1800.

FIG. 19 is another example of an estimated item screen 1900.

10 FIG. 20 is an example of a conceptual diagram 2000 for creating a model for construction-drawing.

FIG. 21 is an example of a conceptual diagram 2100 for creating a construction-drawing for fixture.

FIG. 22 is an example of a construction-drawing for fixture.

FIG. 23 is a partially enlarged view 2300 of FIG. 21.

15 FIG. 24 is another example of a construction-drawing for fixture.

FIG. 25 is an example of awning information 2500

FIG. 26 is another example of parameter information.

FIG. 27 is another example of a construction-drawing 2700.

20 FIG. 28 is another example of an assembly drawing 2800.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[Embodiment 1]

25 [0009] Hereinafter, construction management systems, construction-drawing management methods, and programs according to the present technology will be described with referring to the figures. For configuration elements having the same function, reference signs and duplicated explanation will be omitted

[Construction management system]

30 [0010] FIG. 1 is one example of a configuration diagram of a construction management system 100 according to one embodiment. The construction management system 100 according to the present technology is configured to be capable of outputting, at an arbitrary timing, a construction-drawing(s) for equipment which is relating to equipment or facility such as a fixture(s), based on BIM (Building Information Modeling) data to be created at a design stage and/or a construction stage of a building. In the present embodiment, a case where a construction-drawing for fixture is output as a construction-drawing for equipment will be described as one example of the present technique.

[0011] As illustrated in FIG. 1, the construction management system 100 includes one or a plurality of management servers 101 and one or a plurality of user terminals 102. Each of one or a plurality of the user terminals 102 is configured to be connectable to one or a plurality of the management servers 101 through a network. The network can be wired or wireless, and the

respective terminals are configured to be capable of sending and receiving information to and from each other through the network. The user terminals 102 may be provided to be separated from the management server 101, or may be integrally provided to the management server 101.

[0012] Each of the management server 101 and the user terminal 102 (hereinafter, the management server 101 and the user terminal 102 may be simply referred to as "terminal") to be used in the construction management system 100 may be, for example, a mobile terminal such as a smartphone, a tablet, a mobile phone, or a personal digital assistant (PDA), or a wearable terminal such as a glasses-type (or goggles-type) wearable terminal, a wristwatch-type wearable terminal, or a clothing-type wearable terminal. Any of these devices may be a stationary-type computer or a portable-type computer, or a server disposed on a cloud or a network. From the perspective of the function, any of these devices may be a VR (Virtual Reality) terminal, an AR (Augmented Reality) terminal, or a MR (Mixed Reality) terminal. Alternatively, a combination of a plurality of terminals may be used as the terminal. For example, a combination of one smartphone and one wearable terminal may logically function as one terminal. Other information processing terminals may be used.

[0013] Each of the terminals of the construction management system 100 and the management servers 101 includes a processor for executing an operating system, an application, a program, and the like; a main storage device such as a RAM (Random Access Memory); an auxiliary storage device such as an IC card, a hard disk drive, an SSD (Solid State Drive), or a flash memory; a communication control unit such as a network card, a wireless communication module, or a mobile communication module; an input device such as a touch panel, a keyboard, a mouse, a voice input device, a motion controller or an input device functioning based on motion detection for which images are obtained by a camera; an input device composed of a sensor such as a GPS, a gyrosensor, or an accelerometer; and an output device such as a monitor, a display, a printer, a voice output device, or an oscillator. The output device may be a device or a terminal for transmitting information in order to output it to an external monitor, a display, a printer, a device, or the like.

[0014] The main storage device is configured to store various programs, applications, and the like (software modules) therein such that when a processor executes any of these programs and applications, each functional element of the entire system is realized. Each module may be implemented as an independent program or an application, or each module may be implemented in a form of a subprogram or function in a part of a single integrated program or application. Also, each module may be implemented as a hardware (hardware module), such as by integrating a circuit or employing a microcomputer. Furthermore, each module may be provided in a single terminal (including a management server), or may be provided separately in two or more terminals (including a management server) which are connected to each other via a network. Also, each module may be provided at each one of (alternatively, at one or more of) more than one terminals (including a management server) which are connected to each other via a network. It is also conceivable that some modules may be installed in a country different from another country where the other modules are installed.

[0015] In the present specification, each module is described as a main body (subject) for

executing processing, but in practice, a processor executes processing by executing various programs, applications, and the like.

[0016] The auxiliary storage device is configured to store various databases (DB) therein. A "database" means a collection of data which is collected and organized in order to cope with arbitrary data manipulation (for example, extraction, addition, deletion, and overwrite of data) to be executed by a processor or an external computer. The auxiliary storage device is a functional element (storage part) capable of storing one or a plurality of data sets. The database may be implemented by a database management system, a spreadsheet software, or a text file such as XML, JSON, but the implementation method of the database is not limited to these examples. A part or the whole of these pieces of information may be configured to be stored in a relational database or a non-relational database.

[Management server]

[0017] FIG. 2 is one example of a hardware configuration of the management server 101. The management server 101 is a configuration element for managing the construction management system 100, and is one example of a construction management device in the present technique. Typically, the management server 101 is a terminal to be used by an administrator who manages and operates the construction management system 100. For example, the management server 101 is constituted by a server arranged on a cloud.

[0018] The management server 101 includes a main storage device 201 and an auxiliary storage device 202. The management server 101 also includes a processor 203, an input device 204, an output device 205, and a communication control unit 206, as described above.

[0019] The main storage device 201 stores programs and applications such as a user-terminal-management module 211, an acquisition module 212, a code-information-generation module 213, a selection-reception module 214, a model-information-generation module 215, an output module 216, a drawing module (or rendering module) 217, and a construction-drawing output module 218. The respective functional elements of the management server 101 are realized when the processor 203 executes these programs and/or applications stored in the main storage device 201.

[0020] The auxiliary storage device 202 stores information necessary for operating the construction management system 100. For example, the auxiliary storage device 202 stores project information 400, fixture information 500, parameter information 600, command setting information 700, standard model information 800, code information 900, and the like. Details of these pieces of information will be described later.

[0021] Subsequently, the respective functional elements of the management server 101 will be briefly described. Specific operations of the respective functional elements will be described later.

The user-terminal-management module 211 is configured to manage operations of the user terminal 102. The user-terminal-management module 211 cooperates with the management module 311 or the execution module 312 of the user terminal 102 so as to control basic operations for realizing the functions of the construction management system 100 at the side of the user terminal 102.

[0022] For example, the user-terminal-management module 211 cooperates with the management module 311 so as to output (or display), to the output device 305 (for example, a display) of the user terminal 102, a home page, a login page, a project management page or the like of a construction management site provided on the Web by the management server 101. Also, for example, the user-terminal-management module 211 cooperates with the execution module 311 so as to acquire information to be input by the user terminal 102 through these pages. For example, the user-terminal-management module 211 is capable of operating, based on the acquired information (various kinds of information, instructions, and the like), and capable of outputting (or storing) the acquired information to the auxiliary storage device 202, as project information 400 and the like.

[0023] The acquisition module 212 is configured to acquire or obtain BIM data. For example, the acquisition module 212 cooperates with the management module 311 of the user terminal 102 so as to acquire BIM data (or BIM information) to be used for creating a construction-drawing for fixture. The BIM data may be a BIM file which is readable by BIM software, or may be information (for example, URL information) for accessing the BIM file. In this example, the BIM data includes information relating to a building and constituent members of the building. The acquisition module 212 stores the acquired BIM data, for example, as project information 400.

[0024] The code-information-generation module 213 is a configuration element for generating code information for managing the BIM data at a more detailed level. The code-information-generation module 213 generates code information in which the constituent member included in the BIM data is associated with a plurality of components which constitute the constituent member. The code-information-generation module 213 assigns codes which have been prepared in advance for managing a plurality of components constituting the constituent member. For example, the codes may be set so as to correspond to information of some stages (or levels) required according to the progression status of the construction. Also, the codes corresponding to the components may be associated with detailed information which includes specifications of the components. In this case, the code-information-generation module 213 is not an essential element, but is an additional element in the construction management system 100 according to one embodiment.

[0025] The selection-reception module 214 is configured to receive a selection of a constituent member to be used as an objective for creating a construction-drawing (which is one example of the first constituent member). In the present embodiment, the creation subject of the construction-drawing is a fixture (or door/window) to be provided in the building, and for example, the creation subject is any one type of fixture selected from among a plurality of types of fixtures to be provided in the building. For example, the selection-reception module 214 cooperates with the execution module 312 of the user terminal 102 so as to receive a selection of a constituent member to be used as an objective for creating a construction-drawing, from the user, from among a plurality of constituent members to be provided in a building.

[0026] The model-information-generation module 215 is a configuration element for generating model information for construction-drawing, necessary for causing the below-mentioned drawing module 217 to draw or render a model for construction-drawing (or a

construction-drawing model). The model for construction-drawing is a three-dimensional model of a constituent member to be used as an objective for creating a construction-drawing. In the present technique, this model for construction-drawing is used to create a construction-drawing. For example, the model-information-generation module 215 generates model information for construction-drawing, based on information relating to a configuration element to be used as an objective for creating a construction-drawing. The details of the model information for construction-drawing will be described later.

[0027] The output module 216 is a configuration element for outputting the model information for construction-drawing which has been created by the model-information-generation module 215. For example, the output module 216 outputs the model information for construction-drawing, to the drawing module 217. For example, the output module 216 may store (or output) the model information for construction-drawing, in the auxiliary storage device 202 or in a different kind of storage device.

[0028] The drawing module 217 is a functional element capable of drawing (or rendering) a model for construction-drawing which is a three-dimensional model. In addition, the drawing module 217 is a functional element capable of drawing a construction-drawing, based on the model for construction-drawing. For example, the drawing module 217 draws a model for construction-drawing, based on model information for construction-drawing, received from the output module 216. Also, for example, the drawing module 217 draws a construction-drawing including at least one cross section, based on arbitrary, at least one cross section of the model for construction-drawing.

[0029] In this case, the drawing module 217 is not an essential element, but is an additional element in the construction management system 100 and the management server 101 according to one embodiment. The drawing module 217 is one example of the functional elements to be realized by a drawing software (or rendering software) for construction-drawing, in the present technique. In a case that the management server 101 does not include the drawing module 217, for example, the drawing module 217 may be provided in a different server. For example, the drawing module may be realized when the CPU executes a program of the drawing-module at the side of another computer which is connectable to the management server 101.

[0030] It is preferable that the drawing module 217 is capable of drawing three-dimensional objects. In addition, it is preferable that the drawing module 217 is capable of drawing two-dimensional figures. It is further preferable that the drawing module 217 is capable of performing parametric, three-dimensional modeling (parametric modeling). It is further preferable that the drawing module 217 is capable of designing in a rule-base. Accordingly, it is possible to create a model for construction-drawing, for example, by using a standard model, by a top-down approach. Specifically, for example, when standard models have been prepared in advance as standard models for construction-drawing, for each fixture, it is possible to parametrically change or modify the standard models, based on the predetermined sizes in a rule-base. Therefore, it is possible to easily create a model for construction-drawing corresponding to a predetermined fixture in a predetermined building.

[0031] The construction-drawing output module 218 is configured to output a construction-drawing which has been drawn. For example, the construction-drawing output module 218 cooperates with the execution module 312 of the user terminal 102 so as to display (output) the construction-drawing drawn by the drawing module 217 on a display (which is one example of the output device 305) of the user terminal 102. For example, the construction-drawing output module 218 is capable of displaying a model for construction-drawing drawn by the drawing module 217 on a display of the user terminal 102. Also, the construction-drawing output module 218 may be configured to output the model for construction-drawing and the construction-drawing drawn by the drawing module 217, in a format of image file.

10 [User terminal]

[0032] FIG. 3 is one example of a hardware configuration of the user terminal 102. The user terminal 102 is a terminal to be operated by the user who uses the construction management system 100, and for example, the user terminal 102 is constituted by a terminal such as a smart phone, a tablet, a notebook PC, or a desktop PC. The user terminal 102 includes a main storage device 301 and an auxiliary storage device 302. In addition, the user terminal 102 includes a processor 303, an input device 304, an output device 305, a camera 306, and a communication control unit 307, as described above.

[0033] The main storage device 301 is configured to store programs and applications such as a management module 311 and an execution module 312 such that when the processor 303 executes these programs and/or applications, the respective functional elements of the user terminal 102 are realized.

[0034] The management module 311 performs control of basic operations of the user terminal 102 when the construction management system 100 is used. For example, the management module 311 cooperates with the user-terminal-management module 211 or the like of the management server 101 to output (display) a login page or the like of the construction management site, on the output device 305 (for example, a display) of the user terminal 102.

[0035] The execution module 312 is configured to control various kinds of operations of the construction management site when the construction management system 100 is used. For example, the execution module 312 cooperates with various kinds of modules and the like of the management server 101 to receive an input from the user relating to the construction management site, and to transmit the received information to the management server 101.

[0036] The auxiliary storage device 302 is configured to store information necessary for operating the user terminal 102. For example, the auxiliary storage device 302 stores project information 400 therein. Although not illustrated in FIG. 2, the auxiliary storage device 302 may store fixture information 500 and other information therein. The auxiliary storage device 302 may store a part or the whole of the pieces of information stored in the auxiliary storage device 202 of the management server 101.

[Information DB]

[0037] FIG. 4 is one example of the project information 400.

40 The project information 400 is relating to a construction project or a building project

(hereinafter, simply referred to a "project") to be used for the management. For example, the project information 400 includes information such as a project ID, a project representation ID (or project display ID), a client ID, a client name, a construction company ID, a construction company name, a BIM data ID, a storage location of BIM data, and the like, and values exemplified by the sample values 420 are input for the respective field names 410. Summaries of the field names 410 and the sample values 420 are described in the summary sections 430.

[0038] The project ID is a symbol to be assigned to each project in order to identify a project to be used for the management, and for example, the project ID is automatically generated as a hash-value or the like. Basically, information relating to each project is made to be associated with the project ID. The project display ID is an ID for displaying a project on a screen of the management server 101 or the user terminal 102, etc., and is capable of being arbitrarily set. The client ID and the client name are information relating to the identification ID and the name of the client, respectively. The construction company ID and the construction company name are information relating to the identification ID and the name of the construction company, respectively. The BIM data ID and the storage location of BIM data are the ID or information for identifying BIM data about the target project and its storage location, respectively. However, the content of the project information is not limited to this example.

[0039] FIG. 5 is one example of the fixture information 500 (one example of equipment information).

The fixture information 500 is relating to a fixture(s) to be provided in a building for the project. The fixture is one example of a constituent member which constitutes the building. The fixture information 500 includes, for example, information such as a fixture ID, a project ID, a fixture code, and a quantity, etc., and values exemplified by the sample values 520 are input for the respective field names 510. Summaries of the field names 510 and the sample values 520 are described in the summary sections 530.

[0040] The fixture ID is a symbol to be assigned to identify a fixture in the construction management system 100. The fixture ID is input as a value for a fixture which is used in the project identified by the project ID. The fixture symbol (or fixture code) is an identification code or information to be assigned for identifying a fixture used in each project. The quantity indicates the number of each fixture to be used in the project. However, the content of the fixture information is not limited to this example.

[0041] FIG. 6 is one example of the parameter information 600.

The parameter information 600 is prepared to be used by the drawing module 217 to create a model for construction-drawing, with respect to a predetermined fixture, and to create a construction-drawing. In the present embodiment, for example, dimensions, specifications, and the like which are required to create the model for construction-drawing and the construction-drawing are defined as the parameter information 600, for example, to parametrically create (or to create using parameters) the model for construction-drawing and the construction-drawing, in a rule-base.

[0042] As will be described in detail later, in the present embodiment, the model for

construction-drawing includes a fixture, a floor member for fixing the fixture, and a wall member, which are illustrated in the construction-drawing. For example, a fixture may include a plurality of components such as a door (main body), a frame (casing), a handle, and a hardware such as a hanging metal hardware. For example, the parameter information 600 includes dimensions (or sizes) of these components, design specifications such as dimensions representing relationships between these components, a name of a room in which the fixture is provided, as parameter names (variable), and includes values corresponding to these parameter names, as information.

[0043] For example, the parameter information 600 includes parameter names 610 such as DoorH, DoorW, DoorT, FinsideH, ... ClearanceT ..., and the like, and values are input for the respective parameter names 610 as exemplified in the sampled values 620. Summaries of the parameter names 610 and the sample values 620 are provided in summary sections 650. For example, the DoorH, the DoorW, and the DoorT indicate the height, the width, and the thickness of the door, respectively. The FinsideH refers to the inner dimension of the frame height, and the ClearanceT refers to the dimension between the upper surface of the door and the lower surface of the frame (in other words, refers to the clearance between the door's upper end and the frame). In the present embodiment, the parameter information 600 is made to be stored in csv format.

[0044] FIG. 7 is one example of the command setting information 700.

The command setting information 700 is relating to an instruction to be used for causing the drawing module 217 to create a model for construction-drawing, for a predetermined fixture. The command setting information 700 includes information such as valid/invalid 710, an instruction (or command) 720, a part file name (argument 1) 730, a parameter name (argument 2) 740, a value (argument 3) 750, and the like, for each predetermined fixture.

The valid/invalid 710 specifies whether the instruction 720 is enabled or disabled with respect to the fixture, by 1 or 0, respectively.

The instruction 720 specifies a processing program prepared in advance to cause the drawing module 217 to execute processing.

[0045] In the present embodiment, the instruction "ParamChange" is, for example, a program that converts, with respect to a part specified by the part file name (argument 1) 730, a set parameter specified by the parameter name (argument 2) 740, based on a value specified by the value (argument 3) 750.

Also, in the present embodiment, the instruction "ModelState" is, for example, a program that converts, with respect to a part specified by the part file name (argument 1) 730, a predetermined specification specified by the parameter name (argument 2) 740, into a specification specified by the value (argument 3) 750.

The combination of the instruction 720, the part file name (argument 1) 730, the parameter name (argument 2) 740, and the value (argument 3) 750 is not limited to these examples.

The instruction programs such as the "ParamChange" and "ModelState" are stored, for example, on a cloud in a form to be executed by the drawing module 217.

[0046] FIG. 8 is one example of the standard model information 800.

The standard model information 800 is used to give an instruction, to the drawing module

217, of a storage location (for example, a storage URL) of information on a standard model for a predetermined fixture or on a template for construction-drawing. In the standard model information 800, for example, values are input to the respective items 810, for each predetermined fixture, as exemplified by the sample values 820. Summaries of the items 810 and the sample values 820 are provided in summary sections 830.

[0047] With respect to the item 810, for example, the “inputdrw file” refers to a skeleton model file that includes predetermined rules for the standard model, the “inputcsv file” refers to a csv file that includes values corresponding to the set parameters for the standard model, the “inputasm file” refers to an assembly file for the standard model, and the “01Doorprt file” refers to a door part file for the standard model. In the present embodiment, the item 810 includes template files for construction-drawing (for example, outputpng file and outputpdf file) at the time of outputting the construction-drawing. Sample values 820 corresponding to the respective items 810 indicate storage destinations of the respective files.

[0048] FIG. 9 is one example of the code information 900.

The code information 900 is assigned to a constituent member constituting the objective building, as code information in which the information on the constituent member is associated with the information on components constituting the constituent member. For example, the code information 900 includes information on a fixture code, a door code, and a frame code, etc., and values are input for the field names 910 respectively, as exemplified by the sample values 920. Summaries of the field names 910 and the sample values 920 are described in the summary sections 930.

[Construction Management Method]

[0049] In the construction management system 100 according to the present technique, a construction-drawing is created based on BIM data. FIG. 10 is one example of a flow 1000 for creating a construction-drawing for fixture.

Firstly, at the step S1010, the acquisition module 212 acquires BIM data of a whole building. The acquisition module 212 may acquire the BIM data from a location which is designated by the storage location of BIM data in the project information 400. Alternatively, the acquisition module 212 may cooperate with the execution module 312 of the user terminal 102 so as to acquire the BIM data from a location or the like which is designated by the user. At this time, the acquisition module 212 is capable of registering the location designated by the user, as the storage location of BIM data, in the project information 400, or is capable of storing the acquired BIM data in a predetermined storage location of BIM data. This BIM data includes information corresponding to BIM models of the whole building.

[0050] For example, the BIM models of building are typically constructed as a collection of BIM parts which are corresponding to constituent members such as walls, floors, ceilings, columns, fixtures (doors/windows), and equipment. In addition, the BIM model is a building information model that includes attribution information such as a name of a room, an areas of the room, and the specifications and performances of the constituent member, in addition to the three-dimensional shape information to be created on a computer. The BIM part is capable of including

information (for example, time) relating to the assembly processes and the materials, in addition to the shape information (geometric information) such as the shape, the width, the depth, the height, the position, and the orientation. The BIM parts may be provided as files (for example, RFA files) having IFC data format (ISO16739:2013) to be readable by BIM software. For example, the BIM parts may be created in accordance with the objective constituent members. Alternatively, BIM parts provided in various BIM tools may be used as the BIM parts.

[0051] Incidentally, during the course of the building/construction processes, there are processes of design, construction, and maintenance, and different degrees of detail of information may be required for the respective stages. Therefore, the building BIM is divided into the design BIM to be used in the design stage and the construction BIM to be used in the construction stage. For example, when all data required from the design stage to the construction stage is incorporated into one BIM model, it is possible to avoid a situation where the data capacity of the BIM model becomes too large and the operability of the BIM tool is deteriorated. It is important that, in the building BIM, the information density and the accuracy of the BIM model are set at a required level, for example, on each design stage. Therefore, for example, according to the technique of the Patent Document 1, information necessary for creating a reinforcing-bar arrangement drawing is included in the design BIM data which is created at the design stage. On the other hand, information relating to components of a constituent member (which is, for example, a fixture) is not included in the design BIM data.

[Correlation of Code Information]

[0052] Accordingly, at the step S1020, the code-information-generation module 213 generates code information in which the constituent member included in the BIM data is correlated or associated with a plurality of components which constitute the constituent member, as information on the constituent member. In this case, this step S1020 is an additional step, and may be omitted, for example, in a case that the BIM data is information relating to the construction BIM, in a case that the BIM data acquired by the acquisition module 212 includes information in which the constituent member is associated with its components, and in a case that the same BIM data is acquired again.

[0053] Subsequently, the step S1020 will be described in detail. FIG. 11 is one example of a flow 1100 for associating components, to be executed by the code-information-generation module 213. In this case, the steps 1130 and 1140 are additional steps, and may be omitted.

[0054] (a) At the step S1110, for example, the code-information-generation module 213 first acquires information on the constituent members based on the BIM data. For example, the acquired information (BIM data) is made to be stored in the management DB (not shown). The information of the constituent member at the design stage includes, for example, information of the constituent member itself, and information of space, such as a floor (or story) and a room in which each constituent member is arranged. In addition, the information of each constituent member includes one or more pieces of attribute information relating to the specification of the constituent member. In a case that the constituent member is a fixture(s) (which may be a door or a window), the attribute information includes, for example, items such as "door classification",

"door type", and "law regulation" regarding the required performance, the usage, and the like. For example, the "door classification" may be first attribute information, which includes, for example, "open door" and "sliding door". For example, the "door type" may be second attribute information, which includes "single swing door type", "double swing door type", and "master-slave opening type". And for example, the "law regulation" may be third attribute information, which includes "fire protection equipment", "specified fire protection equipment", and "no regulation". Such information may have different expression formats depending on the creator and the BIM tool to be used.

[0055] (b) Then, the code-information-generation module 213 assigns a predetermined code (b) made common to each attribute information relating to the acquired constituent member. A "LOD (Level of Development)" is used for indicating a degree of detail of the shape information and that of the attribute information, for the BIM model. When the design is completed, the information to be assigned to the BIM model is made to be roughly LOD 350. Therefore, in the following explanations, the code given at the step S1110 is referred to as "350 code". In this case, the 350 code is a code for indicating a degree of detail, corresponding to the LOD in design level.

[0056] For the 350 code, a code DB (not shown) in which the constituent member and its attribution information are associated with the 350 code has been prepared in advance. The code-information-generation module 213 is capable of obtaining the 350 code information corresponding to the constituent member and its attribution information, by inquiring the code DB about the information (BIM data) relating to the constituent member. The code-information-generation module 213 assigns the code information via the code DB, for example, assigns "OP" or the like to the open door with respect to the "door classification", assigns "O1" or the like to the single swing door type with respect to the "door type", and assigns "FRN" or the like to the fire protection equipment with respect to the "law regulation". These pieces of attribute information may be represented as a combination of 350 codes, for example, as "OP_O1_ISAFRN" or the like.

[0057] (c) At the step S1120, for example, the code-information-generation module 213 associates the 350 code information with component code information (375 code information). The 375 code is assigned to one or a plurality of components which constitute the constituent member. With respect to the fixture, for example, the 375 code information is assigned to each of five types of components constituting the fixture, such as a door main body, a frame, a hanging metal hardware, a handle, and another hardware. The 375 code may typically be a code representing the type of each component. Also, the 375 code may be a code representing the performance, the specification, the standard, and the like.

[0058] In one example, the code-information-generation module 213 associates the 375 code with the "door main body" constituting the main body of the above-mentioned fixture, and the 375 code may be, for example, any one of "OP" representing a single swing door, "FL" representing a flash door, "GL1" representing a door in which a glass is added at an upper part of a door end, and "GL2" representing a door in which a louver is added at an upper center part of a door end. The code-information-generation module 213 associates the 375 codes, for example, associates "FL" representing a frame with a "frame" which is a component of the fixture, and associates "HHW"

representing a hinge with a “hanging metal hardware”. These 375 codes are stored in the code DB.

[0059] The types of the components necessary for constituting the constituent member can be determined for a predetermined constituent member. In other words, a predetermined constituent member can be associated with a set of types of components constituting the constituent member. In the present embodiment, the code-information-generation module 213 associates a predetermined 350 code with a set of 375 codes corresponding to the types of required components.

[0060] As illustrated in FIG. 9, the code-information-generation module 213 is capable of setting a combination of the 350 code, for example, "OP_O1_ISAFRN" corresponding to the fixture, and the 375 codes of the respective components, with respect to the components such as the door main body to be used in the fixture. Specifically, the code-information-generation module 213 may assign the 375 code(s) with the 350 code to be mutually combined, and for example, may set a code of "OP_O1_ISAFRN_OP_GR6_S1" with respect to the door main body. Also, for example, the code-information-generation module 213 may set a code of "OP_O1_ISAFRN_FL" with respect to the frame. Also, for example, the code-information-generation module 213 may assign a set of the 375 codes of the respective components with the 350 code relating to the fixture, to be mutually combined, and for example, may set a code of "OP_O1_ISAFRN_OP_GR6_S1_FL_HHW_LH_OT" with respect to the fixture. Such fixture code can include not only the specification of the fixture, but also information relating to the components constituting the fixture. In addition, such fixture code can uniquely associate a fixture with a group of a plurality of components constituting the fixture.

[0061] (d) At the step S1130, for example, the code-information-generation module 213 associates the 375 code information with building member code information (400G code information). The 400G code is used as a representative of the below-mentioned (e) product code information (400 code information). The (e) 400 code is provided corresponding to a specific product capable of being used as a component for constituting each constituent member. Generally, equal or similar products satisfying required standards are provided by the same or different manufacturers. Accordingly, it is possible to associate a plurality of 400 codes with a single 375 code. On this point, in the present technique, a 400G code is set as a code representing the 400 codes for a plurality of products that can be used as such a component. Therefore, it is possible to understand that the (d) 400G code represents (or is collectively referred to as) the (e) 400 codes which are provided for one or more types of products satisfying a predetermined standard, as the representative for each general dimension, specification, and standard. For example, the 400G code may be a code corresponding to the general name of the component.

[0062] (e) At the step S1140, for example, the code-information-generation module 213 associates the 400G code information with product code information (400 code information). For example, the 400 code is provided as a code (for example, "manufacturer code_manufacturer product number") corresponding to any one of various kinds of building members (products) which are sold by manufacturers of the constituent member, as the components. The 400 code can be associated with information relating to the building members (products). For example,

such information relating to the building members may be stored in a product information DB (not shown).

[0063] Generally, information corresponding to the (c) 375 codes, the (d) 400G codes, and the (e) 400 codes is not included in the BIM data at the design stage. The code-information-generation module 213 is capable of setting or assigning the (c) 375 code based on the (b) 350 code. With respect to the (d) 400G code and the (e) 400 code, in a case that these codes are not specially designated by the BIM data or by the user, the code-information-generation module 213 is capable of tentatively setting the general (d) 400G code or the (e) 400 code for a product which is registered as a recommended product corresponding to the (d) 400G code.

[0064] The method of associating the codes (b) - (e), to be carried out by the code-information-generation module 213, is not limited to the above-mentioned example. Correlation of the respective codes may be carried out, by the code-information-generation module 213, according to a predetermined classifying rule that has been determined based on standards such as JIS standards provided for each constituent member, or may be carried by using a learning tool (or learning device), or may be carried by using both of the two. When defining the classifying rule, it is possible to prepare a glossary in which a plurality of different terms representing the same content widely used in planning/designing are linked with each other, in order to unify fluctuations or variations of terms (which are used by the respective persons who create BIM data) into a single term.

[0065] For example, when BIM data having attribute information which represents a specification or a standard of a predetermined configuration member is used as an input value, the learning tool is configured to output a predetermined 350 code corresponding to the predetermined constituent member which is associated with the BIM data, based on the attribute information. Standards, such as JIS standards, have been established for building members, and even though there are variations in the formats for creating BIM data, certain commonalities can be recognized between them. Therefore, such a learning tool can be implemented, for example, as a learning tool by unsupervised learning, a learning tool by supervised learning, a learning tool by reinforcement learning.

[0066] Returning to FIG. 10, at the step S1030, the selection-reception module 214 receives a selection of equipment (for example, a fixture) to be used for creating a construction-drawing from among a plurality of constituent members included in the building. Specifically, for example, the selection-reception module 214 extracts a constituent member(s) to be used for creating a construction-drawing from among a plurality of constituent members included in the building. Subsequently, the selection-reception module 214 cooperates with the execution module 312 of the user terminal 102 to display the extracted constituent member(s) on the output device 305, and to receive a selection of a constituent member (in this case, it is a fixture) to be used for creating a construction-drawing from among the extracted constituent member(s).

[0067] At the step S1040, the selection-reception module 214 acquires a fixture ID of the fixture (which is one example of first constituent member) to be used for creating the construction-drawing. Specifically, for example, the selection-reception module 214 creates a fixture list for

a plurality of fixtures to be included in the building. The fixture list may include information which is capable of roughly identifying the fixture, and for example, is capable of identifying a fixture ID, a specification of the fixture, an installation location, a quantity, and the like, for each fixture. Then, the selection-reception module 214 cooperates with the execution module 312 of the user terminal 102 to display the fixture list on the output device 305. In addition, the selection-reception module 214 receives a user's selection of a fixture to be used for creating the construction-drawing, from the fixture list. Therefore, the selection-reception module 214 acquires the fixture ID about the fixture which is used for creating the construction-drawing.

[Concept of Creating Construction-drawing]

[0068] Hereinafter, a method for creating a construction-drawing to be performed in the construction management system 100 will be described. In a construction-drawing for fixture, a figure and a cross section of a fixture, those of a floor member to which the fixture is built, and those of a wall member are drawn. In addition, the fixture is constituted by a plurality of components such as a door main body and a frame. Therefore, in the present embodiment, a model(s) for construction-drawing (or construction-drawing model) has been created as a three dimensional model in which a fixture (or components such as a door main body and a frame), a floor member, and a wall member are assembled together, such that a construction-drawing for fixture is created by using a front view, a vertical cross section, and a horizontal cross section of the model for construction-drawing. The model for construction-drawing can be constituted by assembling component models (part models) such as a door main body, a frame, a floor member, and a wall member, together.

[0069] FIG. 20 is one example of a conceptual diagram 2000 for creating a model for construction-drawing according to a skeleton model method, which is one type of top-down designing.

In the present embodiment, a so-called template system is adopted such that standard models (A) for creating a construction-drawing for fixture have been prepared in advance, so as to enable to create a model(s) for construction-drawing (B) by deforming or changing the standard model(s) (A) in accordance with the objective fixture. By constructing the standard models (A) themselves based on the top-down designing technique, it becomes possible to create parametric models for construction-drawing. Accordingly, it is possible to efficiently cope with a reworking which may occur frequently in a design stage or a construction stage, for example, to cope with a reworking where even though the basic structure is kept identical, but a "simple modification to sizes of a door main body" or a "replacement of some components" is required,. In the present embodiment, for example, the standard models (A) have been prepared in advance for each possible combination of a door main body and a frame (hardware) and the like.

[0070] In general three-dimensional assembly models, constraint conditions and joining conditions between the part models are provided such that the positions of the respective part models are defined. In the present embodiment, standard models are created according to the skeleton model (framework) method. Specifically, for example, skeleton models each having design parameters, sketches, and geometries have been created in advance, and then assembly

models and part models of the standard model are set to a form to which the above-mentioned design parameters, sketches, and geometries can be referred. Accordingly, the standard model can be configured such that when a shape of a skeleton model is deformed, a shape or the like of the part model(s) is automatically deformed. When creating a model for construction-drawing (B), information for appropriately deforming the standard model (A) into a predetermined shape is required. In addition, information for constructing an appropriate standard model (A) is required. Such information required to create a model for construction-drawing is collectively referred to as model information for construction-drawing.

[Generation of Model Information]

[0071] At the step S1050, the model-information-generation module 215 generates model information for construction-drawing, based on the fixture ID.

FIG. 12 is one example of a flow 1200 for generating model information for construction-drawing, corresponding to the step S1050. During the course of the flow 1200 for generating model information for construction-drawing, the model-information-generation module 215 is capable of executing the step S1210, the step S1230, and the step S1240 in no particular order. The model-information-generation module 215 executes the step S1220 after the step S1210. And the model-information-generation module 215 executes the step S1250 after the steps S1210 - S1240.

[0072] Hereinafter, an explanation will be given in order from the step S1210.

At the step S1210, the model-information-generation module 215 acquires, based on the fixture ID, constituent-member-specification information having parameters required for creating a model for construction-drawing. FIG. 13 is one example of a flow 1300 for acquiring constituent-member-specification information, corresponding to the step S1210 of the flow 1200.

[0073] More specifically, at first, in the step S1310, the model-information-generation module 215 acquires, based on the fixture ID, a list template having parameters necessary for creating a construction-drawing of the fixture. The parameters required for creating a construction-drawing of the fixture are parameters indicated in the parameter names 610 in the parameter information 600, and the list template may be made to be, for example, an information file in which values 620 are not input into the parameter names 610. In the present embodiment, for example, 56 different parameters have been set when creating a construction-drawing for fixture.

[0074] In the present embodiment, a list template has been prepared in advance for each door main body. At least some of the command setting information 700 and the standard model information 800 may be stored in the list template in advance, but the present embodiment is not limited to this example.

[0075] For example, in the parameter information 600 illustrated in FIG. 6, each value 620 to which a check is added in the column of acquired information 630 is included in the BIM data stored in the management DB, the building member information stored in the product information DB, and the like. Therefore, at the step S1320, the model-information-generation module 215 acquires, based on the fixture ID, values corresponding to the parameters according to the BIM data (which may be coded information stored in the auxiliary storage device 202). The model-

information-generation module 215 acquires values corresponding to the parameters from the component information (including the building member information), based on the fixture ID.

[0076] Also, at the step S1330, the model-information-generation module 215 acquires values corresponding to other parameters, based on the fixture ID. For example, in the parameter information 600 illustrated in FIG. 6, for other parameters to which no check is added in the column of the acquired information 630, checks are added in the column of the supplementary information 640. For values 620 to which checks are added in the column of the supplementary information 640, the model-information-generation module 215 is capable of acquiring them based on the above-mentioned BIM data and component information and on the predetermined conditions. In this case, typically, the predetermined conditions may be set such that values corresponding to the parameters are changed, for example, for each predetermined condition or standard. One example of such conditions will be described below.

[0077] It is possible to calculate a dimension from a wall core to a frame front surface/frame back surface along a wall thickness direction at a hinged side or door tip side of a door main body, based on the wall thickness, the frame specification (or information on the dimensions) on the hinged side or door tip side, and on a predetermined calculation formula.

[0078] According to the thickness of the door main body, a clearance value between the door front surface and the frame front surface is set so as to be gradually changed to a predetermined numerical value. For example, it is possible to prepare a correspondence table in which appropriate clearance values are associated with the respective ranges of the thickness of the door main body so as to enable the model-information-generation module 215 to acquire an appropriate clearance value from the correspondence table in accordance with the thickness of the door.

Instead of using the correspondence table, it is possible to define the relation between the conditions and the parameter values, for example, by using condition equations, functional equations (for example, IF function), or the like.

[0079] The strength standard of hinge is set to be stepwisely changed so that a predetermined durability strength is satisfied by the hinge, according to the thickness of the door main body. For example, it is possible to prepare a correspondence table in which specifications of hinges satisfying the required strength and standard are associated with specifications affecting the weights such as the sizes and the materials of the door main body so as to enable the model-information-generation module 215 to select and use a hinge having a specification corresponding to the specification of the door main body in accordance with the correspondence table.

The conditions for acquiring these parameters may be included in the list template prepared for each door main body, in advance.

[0080] At the step S1340, the model-information-generation module 215 inputs the information of the acquired values into the list template. As a result, values corresponding to the parameter names 610 are input in all the value fields 620 of the list template. Accordingly, it becomes possible to obtain the constituent-member-specification information in which the values are input to the list template.

[0081] At the step S1350, the model-information-generation module 215 outputs the

constituent-member-specification information in which the values have been input in the list template. For example, the model-information-generation module 215 may store (output) the constituent-member-specification information in the auxiliary storage device 202 or the like.

5 [0082] Returning to FIG. 12, at the step S1220, the model-information-generation module 215 acquires "parts numerical information" which specifies values for components to be used in the objective fixture, from the constituent-member-specification information. The parts numerical information refers to a value(s) 620 associated with the parameter name(s) 610 in the constituent-member-specification information (parameter information 600). These pieces of parts numerical information may be used, for example, as dimensional values to be displayed in the construction-
10 drawing.

[0083] At the step S1230, the model-information-generation module 215 acquires command setting information 700 for setting a command which gives an instruction to the drawing module to perform drawing with specified values for each component. For example, the command setting information 700 is capable of including information in which a common instruction 720, a
15 part file name (argument 1) 730, and a parameter name (argument 2) 740 are combined together for each type of structure member. For example, the command setting information 700 is capable of including information in which valid/invalid 710, a parameter name 740 (argument 2), and a value 750 (argument 3) according to a fixture are combined together for each predetermined fixture. Common instructions 720 and arguments of the command setting information have been prepared
20 in advance for each type of the structure member.

[0084] For example, when a fixture which is set to be opened along the left direction in the standard model is deformed to be opened along the right direction, the model-information-generation module 215 acquires the instruction of valid/invalid 710 for "ModelState", which is an instruction 720 for the part file name "01Door file", as "1" indicating that it is valid, instead of "0"
25 indicating that it is invalid.

[0085] Also, for example, when a door main body of which door height size is set to be 1992mm, in the standard model, is deformed to have a different door height size (for example, 2100mm), the model-information-generation module 215 acquires a value 750 (argument 3) corresponding to the parameter name 740 "DoorH", in the part file names 730 of from "01Door file" to "09WRfile", as the different size (for example, 2100mm). For example, when the door
30 width of the door main body is deformed, the model-information-generation module 215 acquires the value 750 (argument 3) corresponding to the parameter name 740, "DoorW", by setting the value 750 to the objective size. Accordingly, it becomes possible to give an instruction to the drawing module 217 to draw the part model of the standard model with the specified values.

35 [0086] At the step S1240, the model-information-generation module 215 acquires component model information relating to the standard model, and assembly information thereof, based on the fixture ID. As described above, since the standard models have been prepared in advance, the model-information-generation module 215 acquires known information relating to the storage destinations of the component model information of the standard model and of the assembly
40 information thereof. In a case that the component model information and the assembly

information are stored in the list template, the model-information-generation module 215 may acquire information relating to the storage destinations of the component model information and the assembly information on the basis of the list template (constituent-member-specification information).

5 [0087] At the step S1250, the model-information-generation module 215 outputs the information which has been acquired in the steps of from S1220 to S1240, as the model information for construction-drawing. The model-information-generation module 215 outputs, for example, the created model information for construction-drawing to the output module 216.

10 [0088] Returning to FIG. 10, at the step S1060, the output module 216 outputs the model information for construction-drawing which has been created by the model-information-generation module 215. For example, the output module 216 may output (store) the model information for construction-drawing to the auxiliary storage device 202. Also, for example, the output module 216 may output the model information for construction-drawing to the drawing module 217.

15 [Output of Construction-drawing for fixture]

[0089] FIG. 14 is one example of a flow 1400 for outputting a construction-drawing for fixture.

At the step S1410, the drawing module 217 acquires the model information for construction-drawing which has been output from the output module 216.

20 At the step S1420, the drawing module 217 creates a model for construction-drawing based on the received model information for construction-drawing.
(Skeleton Method)

[0090] Hereinafter, a case where the skeleton method is adopted for creating a model for construction-drawing will be described, as illustrated in FIG. 20, but the creation method is not limited to this example. According to the skeleton method, standard models of fixture are prepared in advance for creating construction-drawings using the skeleton models. The skeleton model refers to a sketch model in which parameter information and technical information necessary for constructing fixtures are incorporated. The skeleton model includes basic designs (rules) to be used as objectives for designing, and information (geometries of work) about connection points, constrained surfaces, and axes of the respective part models at the assembling positions. The skeleton model may also include solid elements corresponding to the volumes.

30 [0091] For example, the above-mentioned technical information includes the know-how possessed by skilled draftsmen, and this know-how is also incorporated into the skeleton model, for example, as the rules. In addition, the skeleton model defines sizes of the part models, values relating to the angles of the arrangements, and other design values and standard values, as parameters. The part models and the assembly models of the standard model respectively refer to the skeleton model.

40 [0092] For example, the drawing module 217 constructs (or draws) a standard model of a predetermined fixture, based on the standard model information 800 from among the model information for construction-drawing. Subsequently, the drawing module 217 may construct (or draw) a model for construction-drawing, for example, by deforming the standard model, based on

the parameter information 600 and the command setting information 700 from among the model information for construction-drawing.

[0093] In the present embodiment, for example, in the standard model and in the model for construction-drawing, a wall member is divided in the approximately horizontal direction along a frame member (upper) which is disposed at an upper side of a door main body so that the wall member is divided into a wall member (left part), a wall member (upper part) and a wall member (right part). Accordingly, the wall member is made to be smoothly deformed in response to a change in the sizes of the door main body.

[0094] In addition, in the present embodiment, construction-drawing templates have been prepared in advance, for example, to include a front view (figure), a vertical cross-sectional view (cross section), a horizontal cross-sectional view (cross section), dimension lines, and dimensions of the standard model. The standard model information 800 also includes information on the storage locations of these construction-drawing-template files. The drawing module 217 is configured to automatically draw a construction-drawing for fixture with respect to the model for construction-drawing, based on the construction-drawing-template file which has been specified by the standard model information 800. For example, the drawing module 217 creates a construction-drawing for fixture, based on a predetermined cross-section(s) of the model for construction-drawing which has been created.

[0095] FIG. 22 is one example of a construction-drawing for fixture 2200. FIG. 23 is a partially enlarged view 2300 of FIG. 21. In the example of FIG. 22, a construction-drawing template is prepared to include a front view (figure), a top plan view, a side view, a vertical cross-sectional view, a horizontal cross-sectional view, dimension lines, and dimensions of a standard model. And the drawing module 217 draws, based on this construction-drawing template, a construction-drawing for fixture 2200 including a front view (figure), a top plan view, a side view, a vertical cross-sectional view, a horizontal cross-sectional view, dimension lines, and dimensions of the model for construction-drawing. For example, as illustrated in Fig. 23, the dimension from the wall core to the front surface side or back surface side of the frame part is a parameter value which has been acquired as supplementary information by the model-information-generation module 215 for displaying it in the cross-sectional view of the fixture.

[0096] FIG. 24 is another example of the construction-drawing for fixture 2400. In the example of FIG. 24, a construction-drawing template is prepared to include a front view (figure), a top plan view, a side view, and a perspective view of a standard model. And the drawing module 217 draws, based on this construction-drawing template, a construction-drawing for fixture 2400 including a front view (figure), a top plan view, a side view, and a perspective view of the model for construction-drawing. The construction-drawing for fixture 2400 may not include a cross-sectional view. In addition, the construction-drawing for fixture 2400 may include a perspective view.

[0097] At the step S1430, the construction-drawing output module 218 outputs the construction-drawing for fixture 2200 which has been drawn by the drawing module 217. For example, the construction-drawing output module 218 cooperates with the execution module 312

of the user terminal 102 to output the construction-drawing for fixture 2200 to the output device 305 (display) of the user terminal 102

[0098] FIG. 15 is one example of a construction-drawing-information screen 1500. The construction-drawing output module 218 cooperates with the execution module 312 of the user terminal 102 to display the construction-drawing-information screen 1500 on the display of the user terminal 102. The construction-drawing-information screen 1500 is a screen that enables a viewer to confirm a figure and a cross-sectional view to be displayed in a construction-drawing for fixture, for each fixture. The construction-drawing output module 218 displays, on the construction-drawing-information screen 1500, a screen name 1501, a fixture symbol (or fixture code) 1502, a progress display part 1503, a quantity display part 1504, a figure display tab 1505, a figure of fixture 1506, a download button 1507, a cross-section display tab 1508, a window type information field 1509, and a comment button 1510. The progress display part 1503 indicates whether a construction-drawing for fixture has been created (output) or not.

[0099] At the center part of the construction-drawing-information screen 1500, the figure display tab 1505 is selected between the figure display tab 1505 and the cross-section display tab 1508. In this case, the construction-drawing output module 218 highlights the figure display tab 1505, but does not highlight the cross-section display tab 1508, and displays the figure of fixture 1506 in the display field at the center of the screen. The figure of fixture 1506 is a front view part of the construction-drawing for fixture which has been drawn by the drawing module 217. In a case that only the front view is displayed when the user views the construction-drawing on the display, the user is allowed to easily recognize the front view up to details.

[0100] At the right part of the window type information field 1509, there provided are the window type information field 1509, the basic information field, the frame information field, the door information field, and the metal hardware information field, and the window type information field 1509 is selected such that the window type information is displayed. In a case that another field is selected, the window type information is disappeared, and the information of the selected field is appeared. The construction-drawing output module 218 displays, in the window type information field 1509, detailed information on the window type of the fixture specified by the fixture ID corresponding to the fixture symbol 1502. When accepting a button selection of the user using the comment button 1510, the construction-drawing output module 218 displays a comment-input window for accepting an input of an arbitrary comment to be made by the user, at the upper part of the window type information field 1509.

[0101] When the download button 1507 is selected, the construction-drawing output module 218 cooperates with the execution module 312 of the user terminal 102 to output the construction-drawing for fixture as an image file, to the user terminal 102. In this case, the construction-drawing output module 218 is configured to be capable of outputting the construction-drawing for fixture having a format according to the construction-drawing template, as an image file (for example, PDF format, PNG format, or the like), to the user terminal 102.

[0102] FIG. 16 is another example of the construction-drawing-information screen 1600. In the construction-drawing-information screen 1600, the cross-section display tab 1608 is selected.

In this case, the construction-drawing output module 218 highlights the cross-section display tab 1508, but does not highlight the figure display tab 1505, and displays the cross-sections of fixture 1606A, 1606B in the display field at the center part of the screen.

[0103] FIG. 17 is another example of the construction-drawing-information screen 1700.

5 For example, the construction-drawing output module 218 may be configured to display 3D view button 1711, in addition to the download button 1707, on the construction-drawing-information screen 1700. When the 3D view button 1711 is selected, the construction-drawing output module 218 highlights the 3D view button 1711 and displays the 3D view window 1712 in the display field at the center part of the screen. For example, the construction-drawing output module 218 displays the 3D view window 1712 to be superimposed on the cross-sections of fixture 1706A, 1706B. In the 3D view window 1712, a 3D view of the fixture is displayed based on the BIM data. Accordingly, it becomes possible to confirm the installation condition and the like of the fixture, based on more specific information.

[Modification of Fixture]

15 [0104] FIG. 18 is one example of an estimated item screen 1800.

The selection-reception module 214 cooperates with the execution module 312 of the user terminal 102 to display the estimated item screen 1800 on the display of the user terminal 102. The estimated item screen 1800 is a screen enables a viewer to confirm the information of the components constituting the fixture, the attachment thereof, the specification, and the like and to change the information, for each fixture. For example, the selection-reception module 214 displays, on the estimated item screen 1800, a screen name 1801, a fixture symbol (or fixture code) 1802, a progress display part 1803, a quantity display part 1804, a window type information field 1805, a door classification field 1806, a selection display field 1807, an selection field 1808, a door type field 1809, an external/internal field 1810, a comment button field 1811, a save button 25 1812, and a split button 1813.

[0105] The progress display part 1803 indicates whether any change (modification) has been made to the component or not. The window type information field 1805 displays detailed information relating to the window type of the fixture specified by the fixture ID which is corresponding to the fixture symbol 1802. The information of the window type information field 30 1805 is the same as the information displayed in the window type information field 1509 on the construction-drawing-information screen 1500. The door classification field 1806, the door type field 1809, the external/internal field 1810, and the like refer to item names of the window type information, and the selection-reception module 214 displays values corresponding to these item names, in the selection display field 1807. Initially, the code information which has been assigned by the code-information-generation module 213 is selected based on the BIM data.

[0106] When accepting a selection of a downward triangle mark at the right end of the selection display field 1807, the selection-reception module 214 displays options of various values corresponding to the item name, for example, as the pull-down selection field 1808. When accepting a selection of another option (value) displayed in the selection field 1808, the selection-reception module 214 changes the value displayed in the selection display field 1807 to the selected 40

option.

[0107] The information changed in the estimated item screen 1800 is reflected in all pieces of fixture information of the project which is managed by the construction management system 100. As a result, when the fixture information is changed in the estimated item screen 1800, it is required to return to the construction-drawing-information screen 1700 so as to create a construction-drawing for fixture based on the changed information.

[0108] When accepting a selection of the save button 1812, the selection-reception module 214 saves the change made in the fixture information, which has been executed on the estimated item screen 1800. The dividing button 1813 refers to a button for dividing a plurality of fixtures into fixtures which are not intended to be changed and fixtures which are intended to be changed, when it is required to change the information for only a part of fixtures, among a plurality of fixtures represented by a single fixture symbol (fixture ID). When accepting a selection of the dividing button 1813, the selection-reception module 214 displays a window (not shown) for assigning a new fixture symbol (fixture ID) to the fixtures which are intended to be changed.

[0109] FIG. 19 is another example of the estimated item screen 1900.

In the estimated item screen 1900, a value selection field 1908 for the door type is displayed. When accepting a selection of a downward triangle mark at the right end of the selection display field 1907, the selection-reception module 214 displays options of various values corresponding to the item name, for example, as the pull-down selection field 1908. When accepting a selection of another option (value) displayed in the selection field 1908, the selection-reception module 214 changes the value displayed in the selection display field 1907 to the selected option.

[0110] With respect to the door type, there provided are a plurality of door types such as “a single swing door type”, “a double swing door type”, “a master-slave opening type”, and “a single sliding type”. When accepting a change, with respect to the door type, from a currently selected “single swing door type” to another door type (for example, double swing door type), the selection-reception module 214 displays the door type after the change (for example, double swing door type) in the selection display field 1907. Subsequently, when the fixture identified by the fixture ID corresponding to the fixture symbol is selected as the subject to be used for creating the construction-drawing for fixture, the model-information-generation module 215 generates the model information for construction-drawing based on the list template and the standard model, both of which have been prepared in advance for the double swing door type.

[0111] According to the construction management system 100 described above, it is possible to output, based on the BIM data, the model information for construction-drawing necessary for causing the drawing module 217 to draw the model for construction-drawing. Accordingly, a system for creating a construction-drawing for fixture (construction-drawing for equipment) based on the BIM data is provided.

[0112] As the characteristic constitution of the above-mentioned construction management system 100, the model-information-generation module 215 acquires constituent-member-specification information including information necessary for creating a model for construction-drawing, based on the fixture ID (information relating to the first constituent member), and then

acquires, from the constituent-member-specification information, (1) value information for specifying a value for a predetermined fixture (for example, first constituent member), and (2) command setting information for setting a command to give an instruction to the drawing module 217 (for example, a drawing software for construction-drawings) to draw the predetermined fixture (for example, first constituent member) with the specified numerical value, and further outputs the acquired value information and command setting information, as the model information for construction-drawing.

[0113] According to this characteristic constitution, it is possible to output the model information for construction-drawing which is capable of causing the drawing module 217 to parametrically create a model for construction-drawing. As a result, even in a case that various types of doors are used in the building, it is possible to quickly and automatically create models for construction-drawing and construction-drawings, for various types of fixtures. In addition, for example, even in a case that reworks occur frequently for changing the type or the like of the fixture during the period from the design stage to the construction stage, it is possible to quickly and automatically create models for construction-drawing and construction-drawings, for the fixture after the change. As a result, it is possible to greatly reduce the burden on the user who creates construction-drawings.

[0114] As the characteristic constitution of the above-mentioned construction management system 100, for example, the model-information-generation module 215 acquires a list template (for example, first template) in which parameters necessary for creating a construction-drawing of a predetermined fixture (for example, first constituent member) are set based on the fixture ID (information relating to the first constituent member), and then inputs value information corresponding to the set parameters into the list template, from the BIM data acquired based on the fixture ID, and further outputs the list template to which the values have been input, as the constituent-member-specification information.

[0115] According to this characteristic constitution, the model-information-generation module 215 is capable of easily creating the constituent-member-specification information by extracting the values corresponding to the parameters, since the parameters required for each fixture have been set in advance. As a result, it is possible to smoothly create a model for construction-drawing and a construction-drawing for fixture without requiring human intervention.

[0116] As the characteristic constitution of the above-mentioned construction management system 100, for example, the model-information-generation module 215 inputs information on values which are corresponding to the set parameters, into a list template, based on the acquired BIM data and the predetermined conditions. Accordingly, it is possible to create a model for construction-drawing and a construction-drawing for fixture, by using information other than the information obtained directly from the BIM data.

[0117] As the characteristic constitution of the above-mentioned construction management system 100, for example, the model-information-generation module 215 acquires, based on the fixture ID (for example, information relating to the first constituent member), constituent-member-specification information including the information on the parameters necessary for creating a

model for construction-drawing, and then acquires, from the constituent-member-specification information, component model information relating to the model for construction-drawing, and assembly information of the component model information, and further outputs the acquired component model information and assembly information, as the model information for construction-drawing.

[0118] According to this characteristic constitution, it is possible to easily and smoothly create a model for construction-drawing, by using the standard models which have been created from the component model information and the assembly information of the component model information. As a result, it is possible to output the information on the construction-drawing such that the complexity of processing can be greatly reduced when the drawing module 217 creates models for construction-drawing.

[0119] As the characteristic constitution of the above-mentioned construction management system 100, for example, the model-information-generation module 215 acquires component information relating to a component(s) constituting a predetermined fixture, on the basis of the information relating to the predetermined fixture (first constituent member), and then outputs, based on the acquired component information, component model information relating to the component model which is a three-dimensional model of the component and constitutes the model for construction-drawing, as the model information for construction-drawing.

[0120] According to this characteristic constitution, it is possible to output the model information for construction-drawing for creating the model for construction-drawing and for creating the construction-drawing for equipment, also based on BIM data (for example. design BIM to be created at the design stage) which does not include the information on components of the constituent member. Accordingly, even in a case that a fixture (equipment) is changed during the course of the design stage, it is possible to easily and smoothly output the model information for construction-drawing, with respect to the fixture (equipment) after the change. Furthermore, it becomes possible to easily and smoothly create the model for construction-drawing and the construction-drawing for equipment, with respect to the fixture (equipment) after the change.

[0121] According to this characteristic constitution, the construction-drawing output module 218 is configured to output, in the construction-drawing, information on a value(s), as a dimensional value(s), corresponding to the parameters required to create a construction-drawing for fixture which has been acquired by the model-information-generation module 215 based on the BIM data and the predetermined condition, among the model information for construction-drawing. As described above, the model-information-generation module 215 acquires the information of values corresponding to the parameters which may not be obtained from the BIM data, and accordingly, for example, it is possible to create the construction-drawing without requiring additional data from the user.

[Embodiment 2]

[0122] The construction management system 100 of the present technology is capable of creating various construction-drawings of equipment, without being limited to the construction-drawing for fixture (which may be a door or a window) illustrated in the first embodiment.

Examples of other equipment and its construction-drawings include construction-drawings, assembly drawings, processing drawings, and detailed simulation drawings, etc., relating to outer groove structures such as gate doors, handrails, and fences, and panel assembling type equipment (furniture, household goods, interior and exterior), and the like. In particular, the present technique can be preferably applied to assembly drawings of custom-made structures, for example, metallic products, in which components are commonly processed to user-specified dimensions by using CNC (computer numerical control) machining and the like.

Hereinafter, the present embodiment will explain about creating a construction-drawing relating to an awning (or eaves) which is an exterior structure around a window.

[0123] The present embodiment will mainly explain the differences from the first embodiment. Features for which no particular mention is made may be the same as in the above-described embodiment 1, and the descriptions will be omitted for the common configurations and operational effects.

[0124] At first, the acquisition module 212 acquires design BIM data (BIM data) of the entire building (step S1010). This BIM data includes information corresponding to BIM models of the entire building, and includes BIM data about an awning which is one of the constituent members.

[0125] Subsequently, the code-information-generation module 213 generates code information in which the constituent member included in the BIM data is associated with a plurality of components constituting the constituent member, as information on the constituent member (step S1020). Specifically, the code-information-generation module 213 inquires the code DB about information (BIM data) relating to the constituent member (in this case, awning), and associates the constituent member with 350 code information corresponding to its attribution information (step S1110). Subsequently, for example, the code-information-generation module 213 associates the 350 code information with component code information (375 code information), building member code information (400G code information), and the product code information (400 code information), in a sequence (from the step S1120 to the step S1140). As for the awning, for example, 375 code information is given to each of 5 types of components which constitute the awning, such as a main body of awning (upper surface plate), a bracket, a curtain plate lid, a connecting member, and the like. Then, for each component, 400 code information relating to the dimensions, specifications, standards, and the like of the specific product of the component is given through the 400G code information. The code-information-generation module 213 stores these pieces of information in the auxiliary storage device 202, as parameter information 600.

[0126] Subsequently, when accepting a selection of "awning" from the user, as the equipment to which a construction-drawing is created (step S1030), the selection-reception module 214 acquires an awning ID of the fixture (one example of the first constituent member) to which a construction-drawing is created (step S1040), and then, the model-information-generation module 215 creates model information for construction-drawing, based on the awning ID (step S1050).

[0127] FIG. 25 is one example of awning information 2500. FIG. 26 is one example of parameter information 2600 relating to the structure member of "awning".

[0128] In detail, the model-information-generation module 215 acquires constituent-member-

specification information having parameters necessary for creating a model for construction-drawing, based on the awning ID (step S1210). Specifically, the model-information-generation module 215 acquires a template (or list template) having a list of parameters which are necessary for creating a construction-drawing of the awning (step S1310), and acquires, based on the fixture ID, values corresponding to parameters derived from the BIM data and/or values corresponding to other related parameters (steps S1320, S1330). For example, the model-information-generation module 215 acquires information from No.1 to 6 from the parameter information 2600, based on the 350 code information which has been obtained directly from the BIM data. For example, the model-information-generation module 215 acquires some pieces of information after No.7 from the parameter information 2600, based on the 400 code information and the like obtained from the code DB. For example, the model-information-generation module 215 acquires the remaining information from the parameter information 2600 according to the need, by using the 400 code information and the like, based on the predetermined conditions.

[0129] The model-information-generation module 215 inputs the information of the acquired values into the list template (step S1340), and then outputs (stores) the constituent-member-specification information in which the values have been input into the list template, to the auxiliary storage device 202 or the like (step S1350).

[0130] The model-information-generation module 215 acquires "parts numerical information" which specifies values for components to be used in the objective fixture, from the constituent-member-specification information (which may be 400 code information) (step S1220). The model-information-generation module 215 acquires command setting information 700 which sets a command for giving an instruction to the drawing module to draw each component with the specified values (step S1230). Commands (or instructions), arguments, and the like relating to the command setting information have been prepared in advance for each type of structure member. The model-information-generation module 215 acquires component model information relating to the standard model and assembly information thereof (both of which may be URL information for the predetermined storage destinations of these pieces of information), based on the awning ID (step S1240). Then, the model-information-generation module 215 outputs the information which has been acquired in the steps of from S1220 to S1240, as the model information for construction-drawing (step S1250). The output module 216 outputs the model information for construction-drawing which has been generated by the model-information-generation module 215 (step S1060).

[0131] The drawing module 217 acquires the model information for construction-drawing which has been output by the output module 216 (step S1410), and creates a model for construction-drawing based on the received model information for construction-drawing (step S1420). The drawing module 217 creates a model for construction-drawing based on a skeleton model which has been prepared in advance for each combination of the type of the awning and the other components. For example, the drawing module 217 constructs (or draws) a standard model based on the skeleton model of the awning, according to the standard model information 800 in the model information for construction-drawing. Then, for example, the drawing module 217

constructs (or draws) a model for construction-drawing by deforming the standard model, based on the parameter information 600 and the command setting information 700 in the model information for construction-drawing. The drawing module 217 draws a construction-drawing for fixture with respect to the model for construction-drawing, based on the construction-drawing-template file which has been designated by the standard model information 800 from the prepared construction-drawing-template files. The construction-drawing-template file specifies information which includes, for example, a plan view, a cross-section view, a side view, dimension lines and the like to be drawn in the construction-drawing for fixture, in advance.

[0132] In place of or in addition to the construction-drawing-template files, it is possible to prepare assembly-drawing-template files in advance, so as to cause the drawing module 217 to draw an assembly drawing, based on, for example, an assembly-drawing-template file of a part of an awning (for example, a constituting member). In this case, the model information for construction-drawing includes information necessary for creating the assembly drawing.

[0133] The construction-drawing output module 218 outputs a construction-drawing of awning 2700 drawn by the drawing module 217 (step S1430). FIG. 27 is another example of the construction-drawing 2700.

The construction-drawing output module 218 outputs an assembly drawing of awning body 2800 drawn by the drawing module 217 (step S1430). FIG. 28 is another example of the assembly drawing 2800.

For example, it is possible to create the above-mentioned construction-drawing of awning 2700 and assembly drawing 2800 without requiring human intervention, whenever the specification of awning in the BIM data is changed. Therefore, the construction-drawing of awning 2700 and the assembly drawing 2800 have the function as simulation drawings (or simulated drawings). As described above, the present technique provides a system for creating a construction-drawing, an assembly drawing, and a simulation drawing each relating to a constituting member such as an awning, from the BIM data.

(Modification)

[0134] As a method for automatically creating a model for construction-drawing, it is possible to adapt a method other than the skeleton method. As such a method, for example, there is a method for creating an assembly model by combining or constraining part models, without using a skeleton model. In this case, an assembly is designed by specifying variable values which have been defined as the dimensional values of the parts and by specifying constraint conditions (joining conditions) between the components, based on parametric modeling. This makes it possible to build a geometrical relationship between the shapes to be designed so that, for example, it becomes possible to change the shape of the assembly model in accordance with the changes in the dimensional values of the parts.

[0135] In addition, since the parametric modeling is adaptable, it is possible to define the correlation among assemblies, components (or part), and construction-drawings (or figures) such that, when the components or the dimensions of those components are changed (or updated), the change can be automatically reflected in the model for construction-drawing (or assembly) and the

construction-drawing (or figure).

[0136] For example, the skeleton model files, the assembly files, and the part model files, each relating to the standard models, may be stored in a cloud storage different from the management server 101. In this case, URL of the cloud storage in which these files are contained is stored as the value 820 of the standard-model information 800.

[0137] Each module disclosed in the above-mentioned embodiments may be configured by combining a plurality of sub-modules. In addition, some or all of the operations and functions to be executed or realized by one module may be executed or realized by other module(s).

[0138] The present application provides not only the technique relating to the construction management system 100, but also the technique relating to the method for creating a construction-drawing (or construction-drawing-creating method) in another aspect. The construction-drawing-creating method includes a step of displaying information which indicates information on constituent members for each structure, based on the management information in which information on the structure constituting the building is associated with information on constituent members constituting the structure, in the construction management table of the building. Then, in this step of displaying information, when a degree of detail of the information relating to the configuration of the constituent members satisfies the predetermined condition, based on the management information, information indicating the types of the constituent members of the structure is displayed in the construction management table with information different from a case where the criterion is not satisfied.

[0139] The present technology also provides a program for causing a server to execute each step of reservation management method. This program may be composed of one program or two or more subprograms. Further, it may be a program for causing a server to execute any one or two or more of the above-mentioned steps.

[0140] The present technology also provides a program for causing a computer to execute each step of the construction-drawing-creating method. This program may be composed of one program or two or more subprograms. Further, it may be a program for causing a computer to execute any one or two or more of the above-mentioned steps.

[0141] In addition, any one or two or more of the configuration elements of one or a plurality of the management servers 101 and one or a plurality of the user terminals 102, both constituting the present construction management system 100, may be installed in different countries from each other. Further, the management server 101 may be realized by one or a plurality of computers, and any one of them may be installed in different countries.

[0142] The present technology is not limited to the above-described embodiments, and includes various modifications. For example, the above-described embodiments have been described in detail such that the present technology can be easily understood, but the present technology is not necessarily limited to the cases having all the described configurations. It is also possible to replace a part of one configuration of one embodiment with that of another embodiment, and is also possible to add a configuration of one embodiment to that of another embodiment. In addition, it is also possible to add, delete, or replace a part of a configuration of

each embodiment with respect to another configuration.

[0143] In addition, some or all of the above-described constitutions, functions, processing units, processing means, and the like may be realized by a hardware, for example, by designing them with an integrated circuit. Also, the above-described constitutions, functions, and the like may be realized by a software, for example, by using a processor capable of interpreting and executing a program for realizing the respective functions. It is possible to store information such as programs, tables, and files capable of realizing the respective functions, in a storage device such as a memory, a hard disk, or an SSD (Solid State Drive), or a storage medium such as an IC card, an SD card, or a DVD.

[0144] In addition, control lines and information lines considered to be necessary for explanation are illustrated, but not necessarily all the control lines and the information lines are illustrated in the product. In practice, almost all of the constitutions may be considered to be interconnected with each other.

The above-described embodiments disclose at least configurations described in the claims.

The present inventions include any one or two or more of the below-mentioned [configuration 1] to [configuration 14] and an arbitrary combination of two or more of them.

[Configuration 1]

According to a first configuration of the present invention, there is provided a construction management system for building, includes:

an acquisition part configured to acquire BIM data including information on a building and its constituent members;

a selection reception part configured to receive a selection of a first constituent member from among the constituent members;

a model information generation part configured to generate, based on information on the first constituent member, model information for construction-drawing, wherein the model information for construction-drawing is required to draw or render a model for construction-drawing, which is a three-dimensional model for creating a construction-drawing; and

an output part configured to output the generated model information for construction-drawing.

[Configuration 2]

In the construction management system according to the configuration 1, the model information generation part may be configured to:

acquire, based on the information on the first constituent member, constituent-member-specification information including information required to create the model for construction-drawing;

acquire, from the constituent-member-specification information, value information for specifying a value for the first constituent member, and command setting information for setting a command that instructs (or give an instruction to) a drawing software (or rendering software) for construction-drawings to draw or render the first constituent member with the specified value; and

output the acquired value information and the acquired command setting information as the model information for construction-drawing.

[Configuration 3]

In the construction management system according to the configuration 1 or 2, the model information generation part may be configured to:

5 acquire, based on the information on the first constituent member, a first template in which parameters required to create a construction-drawing of the first constituent member are set;

 input, into the first template, information on a value(s) corresponding to (or associated with) the set parameters from the BIM data acquired based on the information on the first constituent member; and

10 output the first template into which the value has been input, as the constituent-member-specification information.

[Configuration 4]

 In the construction management system according to the configuration 3, the model information generation part may be configured to further input, into the first template, information on a value corresponding to the set parameters based on the acquired BIM data and a
15 predetermined condition.

[Configuration 5]

 In the construction management system according to any one of the configurations 1 to 4, the model information generation part may be configured to:

20 acquire, based on the information on the first constituent member, constituent-member-specification information including information on parameters required to create the model for construction-drawing;

 acquire, from the constituent-member-specification information, component model information relating to the model for construction-drawing, and assembly information of the component model information; and

25 output the acquired component model information and the acquired assembly information as the model information for construction-drawing.

[Configuration 6]

 In the construction management system according to any one of the configurations 1 to 5, the model information generation part may be configured to:

30 acquire, based on the information on the first constituent member, component information relating to a component(s) constituting the first constituent member; and

 output, based on the acquired component information, component model information as the model information for construction-drawing, wherein the component model information relates to a component model(s) which is a three-dimensional model of the component and constitutes the
35 model for construction-drawing.

[Configuration 7]

 The construction management system according to any one of the configurations 1 to 6, may further include a construction-drawing output part configured to output a construction-drawing including at least one cross section of the model for construction-drawing to be drawn or rendered
40 based on the model information for construction-drawing which has been output.

[Configuration 8]

In the construction management system according to the configuration 7, the construction-drawing output part may be configured to output, in the construction-drawing, as a dimensional value(s), information on a value(s) corresponding to the parameters required to create a construction-drawing of the first constituent member which has been acquired by the model information generation part based on the BIM data and a predetermined condition, among the model information for construction-drawing.

[Configuration 9]

The construction management system according to any one of the configurations 1 to 8, may further include a code information generation part configured to generate, as the information on the first constituent member, code information that associates the constituent member included in the BIM data with a plurality of components constituting the constituent member.

[Configuration 10]

In the construction management system according to any one of the configurations 1 to 9, the constituent member may be a fixture(s) and the construction-drawing may be a construction-drawing for fixture.

[Configuration 11]

In the construction management system according to any one of the configurations 1 to 10, the BIM data may include information on a second constituent member, which is different from the first constituent member and is provided in the building, and

wherein in a case that the second constituent member is set as the constituent member by the selection reception part, the model information generation part may generate model information for construction-drawing relating to the second constituent member, based on information on the second constituent member.

[Configuration 12]

In another configuration of the present invention, there is provided a construction management method for building (or method for managing construction of building), including steps of:

acquiring BIM data including information on a building and its constituent members;

receiving a selection of a first constituent member from among the constituent members;

generating, based on information on the first constituent member, model information for construction-drawing, wherein the model information for construction-drawing is required to draw or render a model for construction-drawing, which is a three-dimensional model for creating a construction-drawing; and

outputting the generated model information for construction-drawing.

[Configuration 13]

In another configuration of the present invention, there is provided a program for causing a computer to execute the steps of the construction management method according to the configuration 12.

[Configuration 14]

In another configuration of the present invention, there is provided one or a plurality of tangible, non-transitory, storage medium,

wherein the storage medium is readable by a computer, and stores instructions causing the computer to execute computer processing on a computer system, and

5 wherein the computer processing includes the steps of the method according to the configuration 12.

[Explanation of Reference numerals]

[0145]

100... Construction management system,

10 101... Management server,

102... User terminal,

211... User-terminal-management module,

212... Acquisition module (or acquisition part),

213... Code-information-generation module,

15 214... Selection-reception module (or selection-reception part),

215... Model-information-generation module (or model-information-generation part),

216... Output module (or output part),

217... Drawing module,

218... Construction-drawing output module,

20 311... Management module,

312... Execution module

What is claimed is:

Claim 1.

A construction management system for building, comprising:

an acquisition part configured to acquire BIM data including information on a building and
5 its constituent members;

a selection-reception part configured to receive a selection of a first constituent member from
among the constituent members;

a model-information-generation part configured to generate, based on information on the first
constituent member, model information for construction-drawing, wherein the model information
10 for construction-drawing is required to draw a model for construction-drawing, which is a three-
dimensional model for creating a construction-drawing; and

an output part configured to output the generated model information for construction-drawing.

Claim 2.

15 The construction management system according to claim 1, wherein the model-information-
generation part is configured to:

acquire, based on the information on the first constituent member, constituent-member-
specification information including information required to create the model for construction-
drawing;

20 acquire, from the constituent-member-specification information, value information for
specifying a value for the first constituent member, and command setting information for setting a
command that instructs a drawing software for construction-drawings to draw the first constituent
member with the specified value; and

output the acquired value information and the acquired command setting information as the
25 model information for construction-drawing.

Claim 3.

The construction management system according to claim 1 or 2, wherein the model-
information-generation part is configured to:

30 acquire, based on the information on the first constituent member, a first template in which
parameters required to create a construction-drawing of the first constituent member are set;

input, into the first template, information on a value corresponding to the set parameters from
the BIM data acquired based on the information on the first constituent member; and

output the first template into which the value has been input, as the constituent-member-
35 specification information.

Claim 4.

The construction management system according to claim 3, wherein the model-information-
generation part is configured to further input, into the first template, information on a value
40 corresponding to the set parameters based on the acquired BIM data and a predetermined condition.

Claim 5.

The construction management system according to claim 1 or 2, wherein the model-information-generation part is configured to:

5 acquire, based on the information on the first constituent member, constituent-member-specification information including information on parameters required to create the model for construction-drawing;

 acquire, from the constituent-member-specification information, component model information relating to the model for construction-drawing, and assembly information of the
10 component model information; and

 output the acquired component model information and the acquired assembly information as the model information for construction-drawing.

Claim 6.

15 The construction management system according to claim 1 or 2, wherein the model-information-generation part is configured to:

 acquire, based on the information on the first constituent member, component information relating to a component constituting the first constituent member; and

 output, based on the acquired component information, component model information as the
20 model information for construction-drawing, wherein the component model information relates to a component model which is a three-dimensional model of the component and constitutes the model for construction-drawing.

Claim 7.

25 The construction management system according to claim 1 or 2, further comprising a construction-drawing output part configured to output a construction-drawing including at least one cross section of the model for construction-drawing to be drawn based on the model information for construction-drawing which has been output.

30 Claim 8.

 The construction management system according to claim 7, wherein the construction-drawing output part is configured to output, in the construction-drawing, as a dimensional value, information on a value corresponding to the parameters required to create a construction-drawing of the first constituent member which has been acquired by the model-information-generation part
35 based on the BIM data and a predetermined condition, among the model information for construction-drawing.

Claim 9.

40 The construction management system according to claim 1 or 2, further comprising a code information generation part configured to generate, as the information on the first constituent

member, code information that associates the constituent member included in the BIM data with a plurality of components constituting the constituent member.

Claim 10.

5 The construction management system according to claim 1, wherein the constituent member is a fixture and the construction-drawing is a construction-drawing for fixture.

Claim 11.

10 The construction management system according to claim 1, wherein the BIM data includes information on a second constituent member, which is different from the first constituent member and is provided in the building, and

 wherein in a case that the second constituent member is set as the constituent member by the selection-reception part, the model-information-generation part generates model information for construction-drawing relating to the second constituent member, based on information on the
15 second constituent member.

Claim 12.

 A construction management method for building, comprising steps of:
 acquiring BIM data including information on a building and its constituent members;
20 receiving a selection of a first constituent member from among the constituent members;
 generating, based on information on the first constituent member, model information for construction-drawing, wherein the model information for construction-drawing is required to draw a model for construction-drawing, which is a three-dimensional model for creating a construction-drawing; and
25 outputting the generated model information for construction-drawing.

Claim 13.

 A program for causing a computer to execute the steps of the construction management method according to claim 12.
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