United States Patent	12392129
Kind Code	B2
Date of Patent	August 19, 2025
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Building and method for constructing building

Abstract

This building comprises a foundation, a main building part that is provided to the foundation and that has a framework structure, and a roof that is provided to the main building part and that has a truss structure. Moreover, a method for constructing the building includes: a first step for forming the foundation; a second step for creating the main building part having a framework structure on the foundation; and a third step for attaching, to the main building part, a roof frame having a pre-assembled truss structure.

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Family ID: **1000008766310**

Appl. No.: **18/019652**

Filed (or PCT Filed): **August 07, 2020**

PCT No.: **PCT/JP2020/030315**

PCT Pub. No.: **WO2022/029989**

PCT Pub. Date: February 10, 2022

Prior Publication Data

Document Identifier	Publication Date
US 20230193620 A1	Jun. 22, 2023

Publication Classification

Int. Cl.: **E04B1/38** (20060101); **E04B7/02** (20060101); E04B1/26 (20060101)

U.S. Cl.:

CPC **E04B1/388** (20230801); **E04B7/022** (20130101); E04B1/2604 (20130101); E04B2001/2648 (20130101)

Field of Classification Search

CPC: E04B (1/388); E04B (7/022)

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS

(1) This Application is a national stage filing under 35 U.S.C. 371 of International Patent Application Serial No. PCT/JP2020/030315, filed Aug. 7, 2020, entitled “BUILDING AND METHOD FOR CONSTRUCTING BUILDING.” The entire content of this application is incorporated herein by reference in its entirety.

TECHNICAL FIELD

(2) The present invention relates to a building and a method for constructing a building.

BACKGROUND ART

(3) Patent Literature 1 discloses a building including a roof that has a truss structure. The roof having a truss structure is coupled to frame members (wall studs in the literature) of a wall.

CITATION LIST

Patent Literature

(4) Patent Literature 1: U.S. Pat. No. 4,073,109

SUMMARY OF INVENTION

Technical Problem

(5) To make the building more earthquake-resistant, reinforcement members are coupled to

horizontal members or the wall. However, coupling the reinforcement members to the horizontal members or the wall in the building is time-consuming and reduces the construction efficiency. Thus, a building and a method for constructing a building capable of reducing the number of reinforcement members are provided.

Solution to Problem

(6) (1) A building that solves the problem includes a foundation, a building body arranged on the foundation, the building body having a Rahmen structure, and a roof arranged on the building body, the roof having a truss structure.

(7) In this configuration, the roof having a truss structure is coupled to the building body having a Rahmen structure.

(8) This limits situations in which the upper part of the building body are distorted by shaking of the ground, and thus limits distortion of the entire building. Accordingly, the building body has fewer reinforcement members.

(9) (2) In the building according to (1), the building body includes vertical members, first horizontal members extending between the vertical members, and second horizontal members extending between the first horizontal members, the second horizontal members intersecting the first horizontal members. The roof includes roof frames fixed to the first horizontal members or the second horizontal members using a metal fitting. The roof frames each include a roof extending member spanning two of the first horizontal members or two of the second horizontal members, rafters coupled to the roof extending member, and a reinforcement member arranged so as to form a truss structure in an outer frame that is defined by the roof extending member and the rafters. The roof frames are fixed to the first horizontal members or the second horizontal members using the metal fitting.

(10) In this configuration, two structures including the first horizontal members are coupled to each other by the roof frames. Alternatively, two structures including the second horizontal members are coupled to each other by the roof frames. This limits situations in which the entire building is distorted by shaking of the ground.

(11) (3) In the building according to (2), one or more frame members are arranged between two of the vertical members. This configuration reinforces the wall that includes the vertical members.

(12) (4) In the building according to (3), the frame members are each formed using dimensional lumbers that have a smaller cross-sectional area than the vertical members, the first horizontal members, and the second horizontal members. This configuration lowers the costs of the frame members.

(13) (5) A method for constructing a building that solves the problem includes a first step that forms a foundation, a second step that forms a building body on the foundation, the building body having a Rahmen structure, and a third step that couples a pre-assembled roof frame to the building body, the roof having a truss structure. In this configuration, the pre-assembled roof frame lowers the amount of work at a construction site and shortens the construction period.

Advantageous Effects of Invention

(14) The building has fewer reinforcement members.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. **1** is a schematic diagram showing a building.

(2) FIG. **2** is a perspective view showing the skeleton frame of the building body.

(3) FIG. **3** is a perspective view showing the foundation metal fitting.

(4) FIG. **4** is a perspective view showing the first coupling metal fitting.

(5) FIG. **5** is a perspective view showing the second coupling metal fitting.

(6) FIG. **6** is a perspective view showing the third coupling metal fitting.
(7) FIG. **7** is a perspective view showing the floor.
(8) FIG. **8** is an exploded perspective view showing the floor.
(9) FIG. **9** is a cross-sectional view showing the reinforcement member.
(10) FIG. **10** is a perspective view showing the roof.
(11) FIG. **11** is a side view showing the roof frame.
(12) FIG. **12** is a perspective view showing a portion where the roof frame is coupled to the roof horizontal member.
(13) FIG. **13** is a perspective view showing a portion where the roof frame is coupled to the roof horizontal member.
(14) FIG. **14** is a perspective view showing a portion where the roof frame is coupled to the roof horizontal member.

DESCRIPTION OF EMBODIMENTS

(15) A building will now be described with reference to FIGS. **1** to **14**. The building of the present embodiment has two floors. FIG. **2** shows the skeleton frame of the first-floor section of a building **1**. FIG. **2** does not show reinforcement members **63** at a floor **60** that is located between the first and second floors.
(16) As shown in FIG. **1**, the building **1** includes a foundation **2**, a building body **3**, and a roof **4**. The building **1** of the present embodiment has multiple floors. The foundation **2** is arranged on the ground. The foundation **2** is made of, for example, reinforced concrete. The building body **3** is arranged on the foundation **2**.
(17) As shown in FIG. **2**, the building body **3** has a Rahmen structure. More specifically, the building body **3** includes vertical members **10**, first lateral members **11**, and second horizontal members **12**. The vertical members **10** are also referred to as posts. The vertical members **10** are made of wood. The vertical members **10** are arranged upright on the foundation **2** using foundation metal fittings **20**.
(18) The vertical members **10** may have a length extending over multiple floors. The vertical members **10** may have a length equivalent to the height of one floor. The lower end face of each vertical member **10** includes a slit **10***c* into which a plate **23** of the corresponding foundation metal fitting **20** is inserted. The slit **10***c* extends from an end face **10***a* of the vertical member **10** in a longitudinal direction of the vertical member **10**. Thus, the inner surface of the slit **10***c* is arranged with the grain of the vertical member **10**. This limits a decrease in the strength of a portion branched by the slit **10***c*. Slits **11***c*, **12***b*, which will be described below, have the same structure. That is, in a member including the slit **11***c* and a member including the slit **12***b*, the slits **11***c*, **12***b* each extend in a longitudinal direction of the corresponding member from its end face perpendicular to the longitudinal direction of the member.
(19) As shown in FIG. **3**, the foundation metal fitting **20** includes a fixed portion **21** fixed to the foundation **2**, a receiving portion **22** located above the fixed portion **21**, and the plate **23** extending upward from the receiving portion **22**. The receiving portion **22** receives the end face **10***a* of the vertical member **10**. The fixed portion **21** of the foundation metal fitting **20** is fixed to the foundation **2** using a bolt. The plate **23** of the foundation metal fitting **20** is fixed to the vertical member **10** using drift pins **24**. The drift pins **24** are inserted into the vertical member **10** so as to extend through the plate **23** and the vertical member **10** in a state of being placed in the slit of the vertical member **10**.
(20) Each first horizontal member **11** extends between and/or across multiple vertical members **10**. The first horizontal member **11** is a longitudinal beam or a transverse beam. In one example, the first horizontal member **11** is arranged such that a side surface **11***b* of the first horizontal member **11** is in contact with the end face **10***a* of the vertical member **10** (see FIG. **4**). In another example, the first horizontal member **11** is arranged such that an end face of the first horizontal member **11** is in contact with a side surface **10***b* of the vertical member **10**. In a further example, the first

horizontal member **11** is arranged such that the end face of the first horizontal member **11** is in contact with a side surface of the second horizontal member **12**.

(21) The second horizontal members **12** intersect the first horizontal members **11**. Each second horizontal member **12** extends between and/or across multiple first lateral members **11**. The second horizontal member **12** is a longitudinal beam or a transverse beam. In one example, the second horizontal member **12** is arranged such that an end face **12***a* of the second horizontal member **12** is in contact with the side surface **11***b* of the first horizontal member **11** (see FIG. **5**). In another example, the second horizontal member **12** is arranged such that the end face **12***a* of the second horizontal member **12** is in contact with the side surface **10***b* of the vertical member **10**.

(22) The vertical members **10** are coupled to the first horizontal members **11** using coupling metal fittings. The first horizontal members **11** are coupled to the second horizontal members **12** using coupling metal fittings. The vertical members **10** are coupled to the second horizontal members **12** using coupling metal fittings. Examples of the coupling metal fittings include first to third coupling metal fittings **30** to **40**, which will be described below.

(23) As shown in FIG. **4**, the first coupling metal fitting **30** couples the vertical member **10** to the first horizontal member **11**. The first coupling metal fitting **30** may couple the vertical member **10** to the second horizontal member **12**.

(24) The first coupling metal fitting **30** includes a tenon protrusion **31** and a plate **32** on the tenon protrusion **31**. The tenon protrusion **31** is configured to be fitted to a tenon hole **11***d* of the first horizontal member **11**. The plate **32** is configured to be inserted into the slit **10***c* of the vertical member **10**. The tenon protrusion **31** is fixed to the first horizontal member **11** using drift pins **24**. The plate **32** is fixed to the vertical member **10** using drift pins **24**.

(25) As shown in FIG. **5**, the second coupling metal fitting **36** couples the second horizontal member **12** to the vertical member **10**. The second coupling metal fitting **36** may couple the second horizontal member **12** to the first horizontal member **11**.

(26) The second coupling metal fitting **36** includes a fixed portion **37** that is fixed to the vertical member **10** or the first horizontal member **11** and a plate **38** that extends from the fixed portion **37**. The fixed portion **37** is fixed to the side surface **10***b* of the vertical member **10** or the side surface **11***b* of the first horizontal member **11** using a bolt. The plate **38** is configured to be inserted into the slit **12***b* of the second horizontal member **12**. The plate **38** is fixed to the second horizontal member **12** using a drift pin **24**.

(27) As shown in FIG. **6**, the third coupling metal fitting **40** couples two (upper and lower) vertical members **10**, the first horizontal member **11**, and the second horizontal member **12** to each other. The third coupling metal fitting **40** includes a shaft **41** and plates **42** that extend from the shaft **41**. The first end of the shaft **41** is configured to be inserted into a tenon hole **10***d* of the upper vertical member **10**. The second end of the shaft **41** is configured to be inserted into a tenon hole **10***d* of the lower vertical member **10**. The plates **42** are located on an intermediate portion of the shaft **41**. The number of plates **42** in the third coupling metal fitting **40** corresponds to the number of horizontal members that are to be coupled to each other. The plates **42** are configured to be inserted into the slit **11***c* of the first horizontal member **11** or the slit **12***b* of the second horizontal member **12**. The plates **42** are fixed to the first horizontal member **11** or the second horizontal member **12** using drift pins **24**.

(28) As shown in FIG. **2**, the building **1** includes frame members **50**.

(29) Each frame member **50** reinforces a wall having a Rahmen structure. The wall includes two vertical members **10** and a first horizontal member **11** or a second horizontal member **12** that extends between and/or across the two vertical members **10**. One or more frame members **50** are arranged between two of multiple vertical members **10**. Preferably, the thickness of each frame member **50** is equal to that of the wall structure.

(30) Each frame member **50** is defined by dimensional lumbers **51**. The cross-sectional area of each dimensional lumber **51** has a smaller cross-sectional area than those of the vertical member **10**, the

first horizontal member **11**, and the second horizontal member **12**. The frame member **50** is shaped into a rectangular frame using the dimensional lumbers **51**. Each dimensional lumber **51** is made of wood in which the ratio of height to width is pre-defined in the market of woods used for construction. For example, in the cross-section of the dimensional lumber **51**, the height is twice as long as the width. The thickness of the frame member **50** is equal to the height of the dimensional lumber **51**.

(31) The upper part of the frame member **50** is fixed to the first horizontal member **11** or the second horizontal member **12** using screws or bolts. The two sides of the frame member **50** are fixed to the vertical members **10** using screws or bolts. Preferably, the two sides of the frame member **50** are coupled using a coupling member **52**. The coupling member **52** is arranged between the two sides and connected to each of the two sides.

(32) As shown in FIG. **7**, the building **1** includes the floor **60** located between the upper and lower floors. The floor **60** is reinforced by the reinforcement members **63**.

(33) The upper floor means a floor that is a level above the lower floor. For example, the floor **60** is located between the first and second floors. In another example, the floor **60** is located between the second and third floors. In a further example, the floor **60** is located between the first underground floor and the ground floors. In the present embodiment, the building **1** has two floors. The building **1** includes the floor **60** located between the first and second floors.

(34) The floor **60** includes first floor extending members **61** and second floor extending members **62** that intersect the first floor extending members **61**. The first floor extending member **61** corresponds to one of the first horizontal member **11** and the second horizontal member **12** in the Rahmen structure. The second floor extending member **62** corresponds to the other one of the first horizontal member **11** and the second horizontal member **12** in the Rahmen structure.

(35) The first floor extending member **61** and the second floor extending member **62** are made of wood. The reinforcement members **63** may be arranged between two first floor extending members **61**. The reinforcement members **63** may be arranged between two second floor extending members **62**.

(36) As shown in FIG. **8**, the reinforcement member **63** includes a plate-shaped body **65**, an upper flange **66**, and a lower flange **67**. The upper flange **66** is formed using a plate member. The upper flange **66** is located at the upper part of the body **65** so as to intersect the body **65**. The lower flange **67** is formed using a plate member. The lower flange **67** is located at the lower part of the body **65** so as to intersect the body **65**.

(37) As shown in FIG. **7**, the reinforcement members **63** are arranged between two second floor extending members **62** in the present embodiment. The two second floor extending members **62** each include support metal fittings **71** that support ends of the reinforcement members **63**. The reinforcement members **63** are supported by the support metal fittings **71** that are arranged at each of the two second floor extending members **62**. More specifically, the opposite ends of the reinforcement member **63** are respectively supported by the support metal fittings **71** from below. An end of the reinforcement member **63** is mounted on a support receiving portion **72** of each support metal fitting **71**. The end of the reinforcement member **63** is not fixed to the support metal fitting **71**. The end of the reinforcement member **63** is not fixed to the second floor extending member **62**. The reinforcement member **63** is arranged such that the end face of the reinforcement member **63** faces the side surface of the second floor extending member **62**. A gap may be provided between the end face of the reinforcement member **63** and the side surface of the second floor extending member **62**. When the building body **3** shakes, the reinforcement member **63** contacts the side surface of the second floor extending member **62**. This limits deformation of the Rahmen structure including the first floor extending members **61** and the second floor extending members **62**. A flooring material is arranged on the reinforcement members **63**. The reinforcement members **63** limits flexing of the flooring material.

(38) As shown in FIG. **8**, the support metal fitting **71** is configured to accommodate an end of the

reinforcement member **63**. The support metal fitting **71** includes the support receiving portion **72** and fixed portions **73**. The support receiving portion **72** supports the lower part of the end of the reinforcement member **63**. The fixed portions **73** extends from opposite ends of the support receiving portion **72**, respectively. The two fixed portions **73** are fixed to the first floor extending member **61** or the second floor extending member **62** using screws. The distance between the two fixed portions **73** is set such that the reinforcement member **63** can be inserted therebetween.

(39) The first floor extending member **61**, the second floor extending member **62**, and the reinforcement member **63** are arranged such that their upper surfaces are flat surfaces flush with each other. This allows for the construction of a flat floor surface that includes the upper surfaces of the first floor extending member **61** and the floor extending member **62**.

(40) As shown in FIG. **9**, the cross-section of the reinforcement member **63** is shaped so as to include a first portion **68** and second portions **69**. The first portion **68** extends vertically. The second portions **69** are arranged on opposite sides of the first portion **68**, respectively, and intersect the first portion **68**. The first portion **68** corresponds to the body **65**. The upper second portion **69** on the upper side of the first portion **68** corresponds to the upper flange **66**. The lower second portion **69** on the lower side of the first portion **68** corresponds to the lower flange **67**.

(41) The roof **4** will now be described with reference to FIGS. **10** to **14**. The roof **4** is arranged on the building body **3**. The roof **4** has a truss structure. As shown in FIG. **10**, the roof **4** includes roof frames **80**. In the present embodiment, the roof frames **80** each have a truss structure.

(42) The roof frames **80** are arranged in parallel on the building body **3**. Preferably, the roof frames **80** are arranged at equal intervals. The roof frames **80** may be connected to each other by a coupling member **84** (see FIG. **13**).

(43) As shown in FIG. **11**, the roof frame **80** includes a roof extending member **81**, rafters **82**, reinforcement members **83**.

(44) The roof extending member **81** spans two first horizontal members **11** or two second horizontal members **12**. The rafters **82** are coupled to the roof extending member **81**. In the present embodiment, the first ends of the two rafters **82** are coupled to each other so as to form a corner that has a predetermined angle. The second ends of the two rafters **82** are spaced apart from each other. The first end of the roof extending member **81** is coupled to a portion near the second end of one of the two rafters **82**. The second end of the roof extending member **81** is coupled to a portion near the second end of the other one of the two rafters **82**. The roof extending member **81** and the two rafters **82** define an outer frame of the roof frame **80**. The reinforcement members **83** are coupled to the outer frame of the roof frame **80** such that a truss structure is formed in the outer frame of the roof frame **80**.

(45) Preferably, the roof extending member **81**, the rafters **82**, and the reinforcement members **83** are formed using the dimensional lumbers **51**. The use of the dimensional lumbers **51** allows the roof frame **80** to have a standard thickness. When the roof frame **80** has a standard thickness, metal fittings being marketed can be used to fix the roof frame **80** to two first horizontal members **11** or two second horizontal members **12**.

(46) The roof frame **80** is fixed to the first horizontal member **11** or the second horizontal member **12** using metal fittings. One of the first horizontal member **11** and the second horizontal member **12** to which the roof frame **80** is fixed is hereinafter referred to as the roof horizontal member **15**. The roof horizontal member **15**, to which the roof frame **80** is fixed, is preferably thicker than a dimensional lumber. For example, the roof horizontal member **15**, to which the roof frame **80** is fixed, has a cross-sectional area greater than that of the dimensional lumber. The roof horizontal member **15**, to which the roof frame **80** is fixed, may be formed using a laminated wood.

(47) Examples of the metal fittings include a first metal fitting **91** and a second metal fitting **95**, which will be described below. The first metal fitting **91** and the second metal fitting **95** each fix the roof extending member **81** of the roof frame **80** to the roof horizontal member **15** at a portion where the roof extending member **81** of the roof frame **80** intersects the roof horizontal member **15**.

(48) As shown in FIG. **12**, the first metal fitting **91** includes a fixed portion **92** and two tabs **93** that sandwich the roof extending member **81**. The fixed portion **92** is fixed to the roof horizontal member **15**. The two tabs **93** protrude from the fixed portion **92**.
(49) As shown in FIG. **13**, the first metal fitting **91** may fix the coupling member **84**, which couples two roof frames **80** to each other, to the roof horizontal member **15**. More specifically, the first metal fitting **91** is arranged on the roof horizontal member **15** to sandwich the coupling member **84** at a portion where the coupling member **84** intersects the roof horizontal member **15**.
(50) As shown in FIG. **14**, the second metal fitting **95** is an elongated metal plate. The second metal fitting **95** is hooked in contact with the upper surface of the roof extending member **81**. Two opposite ends **96**, **96** of the second metal fitting **95** are fixed to the roof horizontal member **15**.
(51) The method for constructing the building **1** will now be described.
(52) The method for constructing the building **1** includes first to third steps. In the first step, the foundation **2** is formed. In the second step, the building body **3** having a Rahmen structure is formed on the foundation **2**.
(53) In the third step, pre-assembled roof frames **80** each having a truss structure are coupled to the building body **3**. More specifically, each roof frame **80** includes rafters **82** and a roof extending member **81**. The roof frames **80** are arranged on the building body **3** such that the roof extending members **81** extend between and/or across the roof horizontal members **15**. The roof extending members **81** of the roof frames **80** are fixed to the roof horizontal members **15** of the building body **3** using metal fittings.
(54) The method for constructing the building **1** may include a fourth step. In the fourth step, pre-assembled frame members **50** are used to reinforce a wall having a Rahmen structure. The fourth step may be performed in the second step or in the third step. More specifically, one or more frame members **50** are fitted between two vertical members **10**, and the frame members **50** are fixed to the vertical members **10** using screws.
(55) The method for constructing the building **1** may include a fifth step. In the fifth step, the reinforcement members **63** reinforce the floor **60** having a Rahmen structure. The fifth step may be performed in the second step or in the third step. For example, the support metal fitting **71** is coupled to each of the two second floor extending members **62** of the floor **60**. The two support metal fittings **71** face each other. Each reinforcement member **63** is arranged on the space between the two support metal fittings **71**, and the ends of the reinforcement members **63** are inserted into the support metal fittings **71** with the reinforcement members **63** brought down. In this manner, the reinforcement member **63** is arranged between the two second floor extending members **62**.
(56) The operation of the present embodiment will now be described.
(57) In conventional construction, the skeleton frames of the building body **3** and the roof **4** are constructed using posts, beams, and the like. The lower part of the building body **3** is fixed to the foundation **2**. The roof **4** is arranged on the upper part of the building body **3**. Due to such a configuration, when the building body **3** shakes, the lower part of the building body **3** may deform to a greater extent than the upper part of the building body **3**. To limit situations in which the upper part of the building body **3** is deformed by the shaking, reinforcement members (angle braces) are arranged at the corners of the first horizontal member **11** and the second horizontal member **12** that intersect each other. Alternatively, reinforcement members (cross braces) that diagonally intersect two vertical members **10** supporting the roof **4** may be arranged between the two vertical members **10**. The arrangement of such reinforcement members is time-consuming and thus lengthens the construction period.
(58) In the building **1** of the present embodiment, the roof **4** has a truss structure. This allows the upper part of the building body **3** to be fixed to the roof **4** having a truss structure, and thus limits situations in which the upper part of the building body **3** are deformed by shaking. Accordingly, the building body **3** has fewer reinforcement members. Thus, the arrangement of such reinforcement members in the building body **3** saves time.

(59) The present embodiment has the following advantages.
(60) (1) The building **1** includes the foundation **2**, the building body **3**, which has a Rahmen structure, and the roof **4**, which has a truss structure. In this configuration, the roof **4** having a truss structure is coupled to the building body **3** having a Rahmen structure. This limits situations in which the upper part of the building body **3** are distorted by shaking of the ground, and thus limits distortion of the entire building **1**. Accordingly, the building body **3** has fewer reinforcement members.
(61) (2) The building body **3** includes the vertical members **10**, the first lateral members **11**, and the second horizontal members **12**, which extend between the first lateral members **11**. The roof **4** includes the roof frames **80**. Each roof frame **80** is fixed to the first horizontal member **11** or the second horizontal member **12** using metal fittings. The roof frame **80** includes the reinforcement members **83**, which are arranged such that a truss structure is formed in the outer frame defined by the roof extending member **81** and the rafters **82**. The roof frame **80** is fixed to the first horizontal member **11** or the second horizontal member **12** using metal fittings.
(62) In this configuration, two structures including the first horizontal members **11** are coupled to each other by the roof frames **80**. Alternatively, two structures including the second horizontal members **12** are coupled to each other by the roof frames **80**. This limits situations in which the entire building **1** is distorted by shaking of the ground.
(63) (3) Preferably, one or more frame members **50** are arranged between two of the vertical members **10**. This configuration reinforces the wall that includes the vertical members **10**.
(64) (4) Preferably, the frame members **50** are formed using the dimensional lumbers **51**, which have a smaller cross-sectional area than the vertical members **10**, the first horizontal members **11**, and the second horizontal members **12**. This configuration lowers the costs of the frame members **50**.
(65) (5) The vertical members **10** may be fixed to the foundation **2** using the foundation metal fittings **20**. The vertical members **10** include the slits **10***c*. Each foundation metal fitting **20** includes the plate **23**, which is inserted into the slit **10***c*, and the fixed portion **21**, which is fixed to the foundation **2**. This configuration allows the vertical members **10** to be strongly fixed to the foundation **2**.
(66) (6) The vertical member **10** and the first horizontal member **11** may be coupled to each other by the first coupling metal fitting **30** (see FIG. **4**). The vertical members **10** include the slits **10***c*, respectively. The first horizontal member **11** includes the tenon hole **11***d*. The first coupling metal fitting **30** includes the tenon protrusion **31**, which is inserted into the tenon hole **11***d*, and the plate **32**, which is inserted into the slit **10***c*. This configuration allows the first horizontal member **11** to be strongly coupled to the vertical member **10**.
(67) (7) The vertical member **10** and the second horizontal member **12** may be coupled to each other by the first coupling metal fitting **30**. The vertical members **10** include the slits **10***c*, respectively. The second horizontal member **12** includes a tenon hole. The first coupling metal fitting **30** includes the tenon protrusion **31**, which is inserted into the tenon hole, and the plate **32**, which is inserted into the slit **10***c*. This configuration allows the second horizontal member **12** to be strongly coupled to the vertical member **10**.
(68) (8) The first horizontal member **11** and the second horizontal member **12** may be coupled to each other by the second coupling metal fitting **36** (see FIG. **5**). The second horizontal member **12** includes the slit **12***b*. The second coupling metal fitting **36** includes the fixed portion **37** and the plate **38**, which is inserted into the slit **12***b*. This configuration allows the second horizontal member **12** to be strongly coupled to the first horizontal member **11**.
(69) (9) The vertical member **10**, the first horizontal member **11**, and the second horizontal member **12** may be coupled to each other by the third coupling metal fitting **40** (see FIG. **6**). The vertical member **10** includes the tenon hole **10***d*. The first horizontal member **11** includes the slit **11***c*. The second horizontal member **12** includes the slit **12***b*. The third coupling metal fitting **40** includes the

shaft **41**, which is inserted into the tenon hole **10***d* of the vertical member **10**, and the plates **42**, which are respectively inserted into the slits **11***c*, **12***b*. This configuration allows the vertical member **10**, the first horizontal member **11**, and the second horizontal member **12** to be strongly coupled to each other.

(70) (10) The method for constructing the building **1** includes the first step, which forms the foundation **2**, the second step, which forms the building body **3** having a Rahmen structure on the foundation **2**, and the third step, which couples pre-assembled roof frames **80** each having a truss structure to the building body **3**. In this configuration, since the roof frames **80** are pre-assembled, the amount of work at a construction site is lowered. As a result, the construction period is shortened.

(71) (11) The method for constructing the building **1** further includes the fourth step, which reinforces a wall having a Rahmen structure using pre-assembled frame members **50**. The fourth step may be performed in the second step or in the third step. The frame members **50** are pre-assembled. At a construction site, the building body **3** is thus reinforced only by coupling the frame members **50** to the building body **3**.

(72) Modifications

(73) The above-described embodiment exemplifies, without any intention to limit, an applicable form of a building and a method for constructing a building. The building **1** exemplified in the embodiment can take a form different from that illustrated in the embodiment. For example, some of the components of the embodiment may be replaced, changed, or omitted. Alternatively, another component may be added to the embodiment. Modifications of the embodiment will now be described.

(74) In the building **1** of the present embodiment, the vertical members **10** is arranged upright on the foundation **2**. Instead, the vertical members **10** may be arranged upright on a base that is arranged on the upper side of the foundation **2**.

(75) The roof frames **80** may be coupled to the roof horizontal members **15** using metal fittings that are similar to the first coupling metal fittings **30** or the second coupling metal fittings **36**.

REFERENCE SIGNS LIST

(76) **1**) Building; **2**) Foundation; **3**) Building Body; **4**) Roof; **10**) Vertical Member; **11**) First Horizontal Member; **12**) Second Horizontal Member; **50**) Frame Member; **51**) Dimensional Lumber; **63**) Reinforcement Member; **80**) Roof Frame; **81**) Roof Extending Member; **82**) Rafter

Claims

1. A building, comprising: a foundation; a building body arranged on the foundation, the building body having a Rahmen structure; a roof arranged on the building body, the roof having a truss structure; and metal fittings, wherein: the building body includes: vertical members; first horizontal members extending between the vertical members; and second horizontal members extending between the first horizontal members, the second horizontal members intersecting the first horizontal members, the roof includes roof frames, at least one roof frame includes: a roof extending member spanning two of the first horizontal members or two of the second horizontal members; rafters coupled to the roof extending member; and a reinforcement member arranged so as to form the truss structure in an outer frame that is defined by the roof extending member and the rafters, the at least one roof frame is fixed to at least one first horizontal member or at least one second horizontal member using at least one metal fitting, the at least one metal fitting includes a fixed portion, two tabs and an attachment portion, the fixed portion is configured to extend away from the at least one roof frame along an upper surface of the at least one first horizontal member or the at least one second horizontal member to which the at least one roof frame is fixed, the fixed portion includes a first edge portion and a second edge portion, and is fixed to the at least one first horizontal member or the at least one second horizontal member to which the at least one roof

frame is fixed, the first edge portion includes an inclined portion that is inclined with respect to an extending direction of the at least one first horizontal member or the at least one second horizontal member to which the fixed portion is fixed, the two tabs protrude from the inclined portion of the fixed portion and sandwich the roof extending member, a distance between the inclined portion and the second edge portion narrows as a distance from the roof extending member sandwiched by the two tabs increases, the attachment portion is configured to extend in one direction from each of the two tabs along the roof extending member sandwiched by the two tabs, and at a portion where the roof extending member intersects the at least one first horizontal member or the at least one second horizontal member, the at least one metal fitting fixes the roof extending member to the at least one first horizontal member or the at least one second horizontal member.

2. The building according to claim 1, wherein: the building body further includes one or more frame members arranged between two of the vertical members, and each of the one or more frame members with a rectangular frame shape includes a top portion, a bottom portion, and opposing side portions.

3. The building according to claim 2, wherein each of the one or more frame members is formed using dimensional lumber that has a smaller cross-sectional area than the vertical members, the first horizontal members, and the second horizontal members.

4. The building according to claim 2, wherein: each of the one or more frame members has a space defined by the top portion, the bottom portion, and the opposing side portions, each of the opposing side portions is in contact with at least one of the vertical members, and extends along the at least one of the vertical members, the top portion is in contact with at least one of the first horizontal members and second horizontal members, and extends along the at least one of the first horizontal members and the second horizontal members, and the bottom portion is in contact with the foundation, and extends along the foundation.

5. The building according to claim 2, wherein: the opposing side portions are respectively fixed to the two of the vertical members using screws or bolts, and the top portion is fixed to one of the first horizontal members and the second horizontal members using screws or bolts.

6. The building according to claim 2, wherein: each of the one or more frame members further includes a coupling member, the coupling member connects the opposing side portions together, the coupling member is arranged between the top portion and the bottom portion, and the coupling member extends parallel to the top portion and the bottom portion.

7. A building, comprising: a foundation; a building body arranged on the foundation, the building body having a Rahmen structure; a roof arranged on the building body, the roof having a truss structure; and metal fittings, wherein: the building body includes: vertical members; first horizontal members extending between the vertical members; and second horizontal members extending between the first horizontal members, the second horizontal members intersecting the first horizontal members, the roof includes roof frames and a coupling member that couples the roof frames to each other, at least one roof frame includes: a roof extending member; rafters coupled to the roof extending member; and a reinforcement member arranged so as to form the truss structure in an outer frame that is defined by the roof extending member and the rafters, the coupling member that couples the roof frames to each other is fixed to at least one first horizontal member or at least one second horizontal member using at least one metal fitting, the at least one metal fitting includes a fixed portion, two tabs and an attachment portion, the fixed portion is configured to extend away from the coupling member along an upper surface of the at least one first horizontal member or the at least one second horizontal member to which the coupling member is fixed, the fixed portion includes a first edge portion and a second edge portion, and is fixed to the at least one first horizontal member or the at least one second horizontal member to which the coupling member is fixed, the first edge portion includes an inclined portion that is inclined with respect to an extending direction of the at least one first horizontal member or the at least one second horizontal member to which the fixed portion is fixed, the two tabs protrude from the inclined

portion of the fixed portion and sandwich the coupling member, a distance between the inclined portion and the second edge portion narrows as a distance from the coupling member sandwiched by the two tabs increases, the attachment portion is configured to extend in one direction from each of the two tabs along the coupling member sandwiched by the two tabs, and at a portion where the coupling member intersects the at least one first horizontal member or the at least one second horizontal member, the at least one metal fitting fixes the coupling member to the at least one first horizontal member or the at least one second horizontal member.

8. The building according to claim 7, wherein: the building body further includes one or more frame members arranged between two of the vertical members, and each of the one or more frame members with a rectangular frame shape includes a top portion, a bottom portion, and opposing side portions.

9. The building according to claim 8, wherein each of the one or more frame members is formed using dimensional lumber that has a smaller cross-sectional area than the vertical members, the first horizontal members, and the second horizontal members.

10. The building according to claim 8, wherein: each of the one or more frame members has a space defined by the top portion, the bottom portion, and the opposing side portions, each of the opposing side portions is in contact with at least one of the vertical members, and extends along the at least one of the vertical members, the top portion is in contact with at least one of the first horizontal members and second horizontal members, and extends along the at least one of the first horizontal members and the second horizontal members, and the bottom portion is in contact with the foundation, and extends along the foundation.

11. The building according to claim 8, wherein: the opposing side portions are respectively fixed to the two of the vertical members using screws or bolts, and the top portion is fixed to one of the first horizontal members and the second horizontal members using screws or bolts.

12. The building according to claim 8, wherein: each of the one or more frame members further includes a coupling member, the coupling member connects the opposing side portions together, the coupling member is arranged between the top portion and the bottom portion, and the coupling member extends parallel to the top portion and the bottom portion.

13. A method for constructing a building, the method comprising: forming a foundation; forming a building body on the foundation, the building body having a Rahmen structure; and coupling pre-assembled roof frames to the building body using metal fittings, the roof having a truss structure, wherein: the building body includes: vertical members; first horizontal members extending between the vertical members; and second horizontal members extending between the first horizontal members, the second horizontal members intersecting the first horizontal members, at least one roof frame includes: a roof extending member spanning two of the first horizontal members or two of the second horizontal members; rafters coupled to the roof extending member; and a reinforcement member arranged so as to form the truss structure in an outer frame that is defined by the roof extending member and the rafters, the at least one roof frame is fixed to at least one first horizontal member or at least one second horizontal member using at least one metal fitting, the at least one metal fitting includes a fixed portion, two tabs and an attachment portion, the fixed portion is configured to extend away from the at least one roof frame along an upper surface of the at least one first horizontal member or the at least one second horizontal member to which the at least one roof frame is fixed, the fixed portion includes a first edge portion and a second edge portion, and is fixed to the at least one first horizontal member or the at least one second horizontal member to which the at least one roof frame is fixed, the first edge portion includes an inclined portion that is inclined with respect to an extending direction of the at least one first horizontal member or the at least one second horizontal member to which the fixed portion is fixed, the two tabs protrude from the inclined portion of the fixed portion and sandwich the roof extending member, a distance between the inclined portion and the second edge portion narrows as a distance from the roof extending member sandwiched by the two tabs increases, the attachment

portion is configured to extend in one direction from each of the two tabs along the roof extending member sandwiched by the two tabs, and at a portion where the roof extending member intersects the at least one first horizontal member or the at least one second horizontal member, the at least one metal fitting fixes the roof extending member to the at least one first horizontal member or the at least one second horizontal member.

14. The method for constructing a building according to claim 13, further comprising coupling one or more pre-assembled frame members to the building body, wherein each of the one or more pre-assembled frame members with a rectangular frame shape includes a top portion, a bottom portion, and opposing side portions, and the one or more pre-assembled frame members are arranged between two of the vertical members.

15. A method for constructing a building, the method comprising: forming a foundation; forming a building body on the foundation, the building body having a Rahmen structure; and coupling pre-assembled roof frames to the building body using metal fittings via a coupling member that couples roof frames to each other, the roof having a truss structure, wherein: the building body includes: vertical members; first horizontal members extending between the vertical members; and second horizontal members extending between the first horizontal members, the second horizontal members intersecting the first horizontal members, at least one roof frame includes: a roof extending member; rafters coupled to the roof extending member; and a reinforcement member arranged so as to form the truss structure in an outer frame that is defined by the roof extending member and the rafters, and the coupling member that couples the roof frames to each other is fixed to at least one first horizontal member or at least one second horizontal member using at least one metal fitting, the at least one metal fitting includes a fixed portion, two tabs and an attachment portion, the fixed portion is configured to extend away from the coupling member along an upper surface of the at least one first horizontal member or the at least one second horizontal member to which the coupling member is fixed, the fixed portion includes a first edge portion and a second edge portion, and is fixed to the at least one first horizontal member or the at least one second horizontal member to which the coupling member is fixed, the first edge portion includes an inclined portion that is inclined with respect to an extending direction of the at least one first horizontal member or the at least one second horizontal member to which the fixed portion is fixed, the two tabs protrude from the inclined portion of the fixed portion and sandwich the coupling member, a distance between the inclined portion and the second edge portion narrows as a distance from the coupling member sandwiched by the two tabs increases, the attachment portion is configured to extend in one direction from each of the two tabs along the coupling member sandwiched by the two tabs, and at a portion where the coupling member intersects the at least one first horizontal member or the at least one second horizontal member, the at least one metal fitting fixes the coupling member to the at least one first horizontal member or the at least one second horizontal member.

16. The method for constructing a building according to claim 15, further comprising coupling one or more pre-assembled frame members to the building body, wherein each of the one or more pre-assembled frame members with a rectangular frame shape includes a top portion, a bottom portion, and opposing side portions, and the one or more pre-assembled frame members are arranged between two of the vertical members.