United States Patent Application Publication 20250263918
Kind Code A1
Publication Date August 21, 2025
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Structure with Structural Insulated Panels Having Integrated Girders

Abstract

The present invention relates to a structure comprising a first level and a second level, wherein the second level is a mezzanine. The structure includes a first structural insulated panel (SIP) forming a portion of a wall or a supporting wall of the mezzanine, and a second SIP forming a wall of an open space adjacent to the mezzanine. The second SIP has a height at least twice that of the first SIP. A third SIP forms at least a portion of a floor of the mezzanine. The first and second SIPs include columns and stress and load-bearing insulators adhered between the columns. The third SIP includes joists and stress and load-bearing insulators adhered between the joists. The second SIP further includes a girder integrated at the height of the mezzanine to support additional joists.

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Family ID: **1000008481164**

Appl. No.: **19/056601**

Filed: **February 18, 2025**

Related U.S. Application Data

us-provisional-application US 63553706 20240215

Publication Classification

Int. Cl.: **E04B1/14** (20060101)

U.S. Cl.:

CPC **E04B1/14** (20130101);

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 63/553,706 titled “Structure with Structural Insulated Panels Having Integrated Girders” filed on 15 Feb. 2024, which disclosure is incorporated herein by reference in its entirety.

TECHNICAL FIELD
[0002] The present application relates to building construction and more specifically to structures built using structural insulated panels.
BACKGROUND
[0003] Previous approaches to constructing structures with multiple levels have typically involved the use of traditional building materials such as wood, concrete, or steel. These materials have been used to create walls, floors, and columns that provide structural support and insulation. However, these conventional construction methods often require complex and time-consuming building processes, resulting in increased construction costs and longer project timelines.
[0004] In the field of structural insulated panels (SIPs), previous approaches have focused on using SIPs as standalone components for walls or floors. SIPs are typically composed of a foam core sandwiched between two rigid panels, providing both structural support and insulation. While SIPs have been effective in improving energy efficiency and reducing construction time, they have not been widely used in multi-level structures due to limitations in load-bearing capacity and design flexibility.
SUMMARY
[0005] In some aspects, the techniques described herein relate to a structure. The structure may include a first level and a second level. The second level may be a mezzanine. The structure may include a first structural insulated panel (SIP), which may have a first height. The first SIP may form a portion of a wall or a supporting wall of the mezzanine. The structure may include a second SIP having a second height. The second height may be at least twice the first height. The second SIP may form a wall of an open space that is adjacent to the mezzanine. The open space may extend from the first level and through the second level. The structure may include a third SIP, which may form at least a portion of a floor of the mezzanine.
[0006] In various implementations, the first SIP or the second SIP may include a first column and a second column, the first column being approximately parallel to the second column, and a first stress and load-bearing insulator between and adhered to the first column and the second column. The third SIP may include a first joist and a second joist, the first joist being approximately parallel to the second joist, and a second stress and load-bearing insulator between and adhered to the first joist and the second joist.
[0007] In various implementations, the second SIP may include a girder that is integrated into the second SIP at a height of the mezzanine. The girder may be configured to support one or more additional joists. The additional joists may be for a future modification of the structure that converts the second level into an additional floor of the structure.
[0008] The first SIP may be, in various implementations, an external wall of the structure. The second SIP may be an external wall of the structure. The first SIP may be positioned beneath the floor of the mezzanine. In some implementations, the first SIP may be positioned on top of the floor of the mezzanine.
[0009] In various implementations, the first insulator of the second SIP may be further adhered to the girder. The girder may be attached to the first column and/or the second column of the second SIP. The girder may be supported by the first column and/or the second column of the second SIP. The girder may protrude from a face of the second SIP, such as towards an interior of the structure

and/or towards an exterior of the structure.
[0010] The second SIP may, in various implementations, include a joist opening adjacent to the girder. The joist opening may be configured to receive the one or more additional joists.
[0011] In some aspects, the techniques described herein relate to a SIP. The SIP may include a first column and a second column. The first column may be approximately parallel to the second column. The SIP may include a stress and load-bearing insulator between and adhered to the first column and second column. The SIP may include an integrated girder supported by the first column and the second column. In various implementations, the integrated girder may be positioned at a top end of the SIP, at a bottom end of the SIP, or between the top end and the bottom end of the SIP.
[0012] In some aspects, the techniques described herein relate to a structure that may include one or more walls, at least one of which is a SIP. The SIP may include a first column and a second column, and the first column may be approximately parallel to the second column. The SIP may include a stress and load-bearing insulator between and adhered to the first column and second column. The SIP may include an integrated girder. The integrated girder may be supported by the first column and the second column. The integrated girder may be supported by the first column and the insulator. The integrated girder may be supported by the second column and the insulator. The integrated girder may be supported by the first column, the second column, and the insulator.
[0013] In some aspects, the techniques described herein relate to a structure having a first level and a second level. The second level may be a mezzanine. The structure may include a first SIP and a second SIP. The second SIP may include a girder integrated into the second SIP. A first set of walls of the structure, which may include the first SIP, may at least partially define and support the mezzanine. The second SIP may at least partially define an open space adjacent to the mezzanine. The open space may extend from the first level and through the second level.
[0014] In some aspects, the techniques described herein relate to a structure that includes a first level and a second level. The second level may be a mezzanine. The structure may include a first set of walls that at least partially define and support the mezzanine. The structure may include a SIP with a girder integrated into the SIP. The SIP may at least partially define an open space in the structure adjacent to the mezzanine, which open space may extend from the first level and through the second level.
[0015] In some aspects, the techniques described herein relate to a structure having a first level and a second level, wherein the second level may be a mezzanine. A SIP may at least partially define or support the mezzanine. The SIP may include a girder integrated into the SIP. In various implementations, the girder may support a floor of the mezzanine.
[0016] In some aspects, the techniques described herein relate to a structure that includes a SIP. The SIP may include a girder integrated into the SIP. The SIP may form at least a portion of a wall of the structure.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0017] The present description will be understood more fully when viewed in conjunction with the accompanying drawings of various examples of structures having structural insulated panels (SIPs) that, in turn, have integrated girders. The description is not meant to limit the structures to the specific examples. Rather, the specific examples depicted and described are provided for explanation and understanding of structures having SIPS with integrated girders. Throughout the description the drawings may be referred to as drawings, figures, and/or FIGs.
[0018] FIGS. **1**A-J illustrate various views of a structure constructed with SIPs, according to an implementation.

[0019] FIGS. **2**A-C illustrate a floor plan of a structure constructed with SIPs, according to an implementation.
[0020] FIGS. **3**A-B illustrate side cross-sectional views of a structure having a mezzanine level, according to an implementation.
[0021] FIGS. **4**A-B illustrate side cross-section views of a structure where the mezzanine level was converted to a second floor using one or more SIPs having integrated girders, according to an implementation.
[0022] FIG. **5** illustrates a SIP with an integrated girder and a set of joist openings, according to an implementation.
[0023] FIG. **6** illustrates a SIP with integrated joists, according to an implementation.
[0024] FIG. **7** illustrates a SIP with a girder integrated at a top end of the SIP, according to an implementation.
[0025] FIG. **8** illustrates a SIP with a girder integrated at a bottom end of the SIP, according to an implementation.
[0026] FIG. **9** illustrates a SIP with an integrated girder supported transversely by a single column, according to an implementation.
[0027] FIG. **10** illustrates a SIP with an integrated girder supported by two columns and an insulator, according to an implementation.
[0028] FIG. **11** illustrates a SIP with an integrated girder supported longitudinally by multiple columns, according to an implementation.
[0029] FIG. **12** illustrates a SIP with an integrated girder where the insulator envelopes the girder and the columns, according to an implementation.
[0030] FIG. **13** illustrates a SIP with an integrated girder protruding from a face of the SIP, according to an implementation.
[0031] FIG. **14** illustrates cross-sectional views of various columns for use in a SIP with an integrated girder, according to an implementation.

DETAILED DESCRIPTION

[0032] A structure having structural insulated panels (SIPs) that, in turn, have integrated girders, as disclosed herein, will become better understood through a review of the following detailed description in conjunction with the figures. The detailed description and figures provide merely examples of the various embodiments of such structures and SIPs. Many variations are contemplated for different applications and design considerations; however, for the sake of brevity and clarity, all the contemplated variations may not be individually described in the following detailed description. Those skilled in the art will understand how the disclosed examples may be varied, modified, and altered and not depart in substance from the scope of the examples described herein.
[0033] Conventional construction techniques for structures such as homes and commercial buildings are time-consuming and expensive. Even with advances such as steel frame construction, structures can take months to build. The time to construct buildings has become a bottleneck that limits the availability of both residential and commercial buildings. This has resulted in sky-rocketing prices. A significant factor in the time it takes to complete construction is the time from groundbreaking to dry-in. The complexity of erecting a frame and making it weather-resistant, and the number of different subcontractors involved in the process, result in a slow-moving process.
[0034] The materials used for conventional structures also have a number of drawbacks. Over time the materials, such as wood, which is most commonly used, degrade, resulting in structural weakness and the need for costly repairs. Conventional structures are also highly susceptible to damage from fire and flooding, and are thermally “leaky,” i.e., heat is leaked into and out of the structure at a high rate. While some advances have curbed such inefficiency, there is significant room for improvement.
[0035] Another issue with conventional construction techniques arises when changes need to be

made to a structure. Residential additions are common, but often require significant demolition of existing parts of the structure and the addition of significant structural components to be sturdy and comply with various building codes.

[0036] Implementations of structures having SIPs with integrated girders may address some or all of the problems described above. A structure having one or more SIPs with integrated girders may be erected in hours, rather than the weeks or months required using conventional techniques. The resulting structure has greatly improved thermal insulation, is fire and water resistant, and can be more easily customized or updated than conventionally-made structures. In particular, the integrated girder allows for greater design flexibility, allowing the structure to be converted from a single-story structure to a multi-story structure in mere days, rather than months.

[0037] FIGS. **1**A-J illustrate various views of a structure **100** constructed with SIPs **102**, according to an implementation. The structure **100** may be a commercial structure. The structure **100** may be a residential structure. The structure **100** may be an agricultural structure. The structure **100** may be a recreational structure. One or more of the SIPs **102** may include an integrated girding (shown in subsequent FIGs. and described below), which may support one or more joists, such as for flooring of a mezzanine or a second floor of the structure. A portion of the exterior walls of the structure **100** may be constructed with the SIPs **102**. All the exterior walls of the structure **100** may be constructed with the SIPs **102**. Some or all of the interior walls of the structure **100** may be constructed with the SIPs **102**.

[0038] The integrated girding may enable the structure to be customized and/or updated, such as by the addition of a balcony **104** and/or a staircase **106**, as shown in FIGS. **1**G-I. The balcony **104** may be supported by one or more joists (shown in subsequent FIGs. and described below) attached to and/or supported by the integrated girding. Similarly, the staircase **106** may be supported by one or more joists attached to and/or supported by the integrated girding. The staircase **106** may lead from a mezzanine or second level of the structure **100** to a rooftop **108** of the structure **100**.

[0039] FIGS. **2**A-C illustrate a floor plan of a structure **200** constructed with SIPs, according to an implementation. The structure **200** may include a first level **202**, a second level **204**, and a third level **206**.

[0040] FIGS. **3**A-B illustrate side cross-sectional views of a structure **300** having a mezzanine level, according to an implementation. The structure **300** may include a first level **302** and a second level **304**. The second level may be the mezzanine, i.e., may be generally open to the first level **302**, and/or may only cover a portion of the first level **302**. The first level **302** may be a ground floor of the structure **300**. The first level **302** may be an intermediate floor of the structure **300**. The second level **304** may be a top floor of the structure **300**. The second level **304** may be an intermediate floor of the structure **300**.

[0041] The structure **300** may include a first SIP **306**. The first SIP **306** may have a height corresponding to a height of the first level **302**. For example, a ceiling height of the first level **302** under the mezzanine may be approximately 8 feet or 9 feet, and a height of the first SIP **306** may be approximately 10 feet. The first SIP **306** may form a portion of a wall or a supporting wall of the mezzanine. In this manner, the first SIP **306** may define the space of the mezzanine.

[0042] The structure **300** may include a second SIP **308**. A height of the second SIP **308** may be approximately twice the height of the first SIP **306**. For example, the height of the second SIP **308** may be approximately 20 feet. The height of the second SIP **308** may correspond to a ceiling height of the open space **310**. For example, the ceiling height of the open space **310** may be approximately 18 feet. The second SIP **308** may form a wall of the open space **310**. The open space **310** may be adjacent to the mezzanine (i.e., the second level **304**) such that the first level **302** is visible from the second level **304**. The open space **310** may extend from the first level **302** and through the second level **304** to a ceiling of the second level **304**.

[0043] The structure **300** may include a third SIP **312**, which may form at least a portion of a floor of the mezzanine. The third SIP **312** may be supported by one or more of the first SIP **306**.

[0044] In various implementations, the second SIP **308** may include a girder **314** that is integrated into the second SIP **308** at a height of the mezzanine. The girder **314** may be configured to support one or more additional joists. The additional joists may be for a future modification of the structure that converts the second level into an additional floor of the structure. The additional joists may be joined to the girder **314** or set on the girder **314**.
[0045] The first SIP **306** may be, in various implementations, an external wall of the structure **300**. The second SIP **308** may be an external wall of the structure **300**. The first SIP **306** may be positioned beneath the floor of the mezzanine. In some implementations, the first SIP **306** may be positioned on top of the floor of the mezzanine. Various implementations include multiple first SIPs **306**. Some may be internal walls. Some may be external walls.
[0046] Various other arrangements of the structure **300** are envisioned. In some implementations, the structure **300** may include one or more walls, at least one of which is a SIP. The SIP may be the first SIP **306** or the second SIP **308**. In some implementations, the structure **300** may include the first level **302** and the second level **304** (which may be a mezzanine). The structure **300** may include the first SIP **306** and the second SIP **308**. The second SIP **308** may include the girder **314**, which may be integrated into the second SIP **308**. A first set of walls of the structure **300**, which may include the first SIP **306**, may at least partially define and/or support the mezzanine. The second SIP **308** may at least partially define the open space **310** adjacent to the mezzanine.
[0047] In some implementations, the structure **300** may include the first level **302** and the second level **304**, which may be a mezzanine. The structure **300** may include a first set of walls that at least partially define and support the mezzanine. The structure **300** may include a SIP with a girder integrated into the SIP, such as the second SIP **308** and girder **314**. The SIP may at least partially define the open space **310** in the structure **300** adjacent to the mezzanine.
[0048] In some implementations, the structure **300** may have the first level **302** and the second level **304**. The second level **304** may be a mezzanine. A SIP may at least partially define or support the mezzanine, such as shown in FIG. **3**B. The SIP may include the girder **314**, which may be integrated into the SIP. The girder **314** may support the floor of the mezzanine (e.g., the third SIP **312**).
[0049] In some implementations, the structure **300** may include at least one SIP, such as the first SIP **306** or the second SIP **308**. The SIP may include the girder **314** integrated into the SIP. For example, the girder **314** may be integrated with the first SIP **306** at a top end of the first SIP **306** to support the third SIP **312**. As another example, the structure **300** may include the first SIP **306** and the second SIP **308**, both of which may have integrated therein girders **314**. The mezzanine floor may be supported by the girder of the first SIP **306** and the girder of the second SIP **308**. The SIP may form at least a portion of a wall of the structure.
[0050] FIGS. **4**A-B illustrate side cross-section views of a structure **400** where the mezzanine level was converted to a second floor **402** using one or more SIPs having integrated girders, according to an implementation. Flooring for the second floor **402** may be supported by one or more joists attached to the integrated girders.
[0051] FIG. **5** illustrates a SIP **500** with an integrated girder **502** and a set of joist openings **504**, according to an implementation. The integrated girder **502** may be positioned in the SIP **500** between a top end and a bottom end of the SIP **500**. The integrated girder **502** may be positioned approximately in a middle of the SIP **500**, such as in implementations where the integrated girder **502** is aligned with a height of a mezzanine level in a structure. The joist openings **504** may be configured to receive the one or more joists, and may be positioned adjacent to and/or above the integrated girder **502** such that, when a joist is inserted into the joist opening **504**, the joist rests on the integrated girder **502** and the integrated girder **502** bears a load of the joist. One or more columns **506** and a second girder **508** may also be integrated in the SIP **500**. The columns **506** may be arranged in the SIP **500** parallel to each other and/or perpendicular to the integrated girder **502**. The second girder **508** may be positioned above the set of joist openings **504** and supported by the

integrated girder **502** by blocking **510**.
[0052] The SIP **500** may include an insulator **512**. The insulator **512** may function to insulate a structure in which the SIP **500** is used against thermal variation within the SIP **500**, electrical current, fire, flood water, and so forth. The insulator **512** may be capable of bearing stress and/or loading, which may enable the SIP **500**, along with the one or more columns **506**, to be a structural component of a building.
[0053] The one or more columns **506** may be formed of one or more rigid materials such as steel, aluminum, oriented stranded board (OSB), wood studs, and so forth. Similarly, the integrated girder **502** may be formed of on or more rigid materials such as steel, aluminum, a combination of slotted wood planks with an OSB webbing, and so forth. The insulator **512** may be formed of one or more moldable plastic materials such as expanded polystyrene. In various implementations, the insulator **512** may be molded around various other components of the SIP **500** such as the integrated girder **502**, the one or more columns **506**, the second girder **508**, and/or the blocking **510**. The insulator **512** may be bonded or adhered to the one or more columns **506**, the integrated girder **502**, the second girder **508**, and/or the blocking **510**. The one or more columns **506** and/or the blocking **510** may be bolted, nailed, strapped, welded, or otherwise attached to the integrated girder **502** and/or the second girder **508**.
[0054] FIG. **6** illustrates a SIP **600** with integrated joists **602**, according to an implementation. The integrated joists **602** may be approximately parallel to each other. The SIP **600** may also include an insulator **604** that is stress- and load-bearing. The insulator **604** may be between and adhered to the integrated joists **602**.
[0055] FIG. **7** illustrates a SIP **700** with a girder **702** integrated at a top end of the SIP **700**, according to an implementation. A “top end” of the SIP **700** may refer to the highest end of the SIP **700** when the SIP **700** is aligned vertically.
[0056] FIG. **8** illustrates a SIP **800** with a girder **802** integrated at a bottom end of the SIP **800**, according to an implementation. A “bottom end” of the SIP **800** may refer to the lowest end of the SIP **800** when the SIP **800** is aligned vertically.
[0057] FIG. **9** illustrates a SIP **900** with an integrated girder **902** supported transversely by a single column **904**, according to an implementation.
[0058] FIG. **10** illustrates a SIP **1000** with an integrated girder **1002** supported by a first column **1004**, a second column **1006**, and an insulator **1008**, according to an implementation.
[0059] FIG. **11** illustrates a SIP **1100** with an integrated girder **1102** supported longitudinally by multiple columns **1104** and an insulator **1106**, according to an implementation.
[0060] FIG. **12** illustrates a SIP **1200** with an integrated girder **1202** where the insulator **1204** envelopes the girder **1202** and the columns **1206**, according to an implementation.
[0061] FIG. **13** illustrates a SIP **1300** with an integrated girder **1302** protruding from a face **1304** of the SIP **1300**, according to an implementation.
[0062] As shown in FIGS. **9-13**, the integrated girder may be vertically and/or horizontally supported by the one of the columns, two of the columns, one of the columns and the insulator, or two of the columns and the insulator. Indeed, the integrated girder may be supported by a plurality of columns in the SIP.
[0063] FIG. **14** illustrates cross-sectional views of various columns for use in a SIP with an integrated girder, according to various implementations. In some implementations, one or more of the columns in a SIP may be a T-column **1402**. In some implementations, one or more the columns in SIP may be a C-channel **1404**. In some implementations, one or more of the columns in a SIP may be a rectangular channel **1406**.
[0064] A feature illustrated in one of the figures may be the same as or similar to a feature illustrated in another of the figures. Similarly, a feature described in connection with one of the figures may be the same as or similar to a feature described in connection with another of the figures. The same or similar features may be noted by the same or similar reference characters

unless expressly described otherwise. Additionally, the description of a particular figure may refer to a feature not shown in the particular figure. The feature may be illustrated in and/or further described in connection with another figure.

[0065] Elements of processes (i.e. methods) described herein may be executed in one or more ways such as by a human, by a processing device, by mechanisms operating automatically or under human control, and so forth. Additionally, although various elements of a process may be depicted in the figures in a particular order, the elements of the process may be performed in one or more different orders without departing from the substance and spirit of the disclosure herein.

[0066] The foregoing description sets forth numerous specific details such as examples of specific systems, components, methods and so forth, in order to provide a good understanding of several implementations. It will be apparent to one skilled in the art, however, that at least some implementations may be practiced without these specific details. In other instances, well-known components or methods are not described in detail or are presented in simple block diagram format in order to avoid unnecessarily obscuring the present implementations. Thus, the specific details set forth above are merely exemplary. Particular implementations may vary from these exemplary details and still be contemplated to be within the scope of the present implementations.

[0067] Related elements in the examples and/or embodiments described herein may be identical, similar, or dissimilar in different examples. For the sake of brevity and clarity, related elements may not be redundantly explained. Instead, the use of a same, similar, and/or related element names and/or reference characters may cue the reader that an element with a given name and/or associated reference character may be similar to another related element with the same, similar, and/or related element name and/or reference character in an example explained elsewhere herein. Elements specific to a given example may be described regarding that particular example. A person having ordinary skill in the art will understand that a given element need not be the same and/or similar to the specific portrayal of a related element in any given figure or example in order to share features of the related element.

[0068] It is to be understood that the foregoing description is intended to be illustrative and not restrictive. Many other implementations will be apparent to those of skill in the art upon reading and understanding the above description. The scope of the present implementations should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

[0069] The foregoing disclosure encompasses multiple distinct examples with independent utility. While these examples have been disclosed in a particular form, the specific examples disclosed and illustrated above are not to be considered in a limiting sense as numerous variations are possible. The subject matter disclosed herein includes novel and non-obvious combinations and sub-combinations of the various elements, features, functions and/or properties disclosed above both explicitly and inherently. Where the disclosure or subsequently filed claims recite “a” element, “a first” element, or any such equivalent term, the disclosure or claims is to be understood to incorporate one or more such elements, neither requiring nor excluding two or more of such elements.

[0070] As used herein “same” means sharing all features and “similar” means sharing a substantial number of features or sharing materially important features even if a substantial number of features are not shared. As used herein “may” should be interpreted in a permissive sense and should not be interpreted in an indefinite sense. Additionally, use of “is” regarding examples, elements, and/or features should be interpreted to be definite only regarding a specific example and should not be interpreted as definite regarding every example. Furthermore, references to “the disclosure” and/or “this disclosure” refer to the entirety of the writings of this document and the entirety of the accompanying illustrations, which extends to all the writings of each subsection of this document, including the Title, Background, Brief description of the Drawings, Detailed Description, Claims, Abstract, and any other document and/or resource incorporated herein by reference.

[0071] As used herein regarding a list, “and” forms a group inclusive of all the listed elements. For example, an example described as including A, B, C, and D is an example that includes A, includes B, includes C, and also includes D. As used herein regarding a list, “or” forms a list of elements, any of which may be included. For example, an example described as including A, B, C, or D is an example that includes any of the elements A, B, C, and D. Unless otherwise stated, an example including a list of alternatively-inclusive elements does not preclude other examples that include various combinations of some or all of the alternatively-inclusive elements. An example described using a list of alternatively-inclusive elements includes at least one element of the listed elements. However, an example described using a list of alternatively-inclusive elements does not preclude another example that includes all of the listed elements. And, an example described using a list of alternatively-inclusive elements does not preclude another example that includes a combination of some of the listed elements. As used herein regarding a list, “and/or” forms a list of elements inclusive alone or in any combination. For example, an example described as including A, B, C, and/or D is an example that may include: A alone; A and B; A, B and C; A, B, C, and D; and so forth. The bounds of an “and/or” list are defined by the complete set of combinations and permutations for the list.

[0072] Where multiples of a particular element are shown in a FIG., and where it is clear that the element is duplicated throughout the FIG., only one label may be provided for the element, despite multiple instances of the element being present in the FIG. Accordingly, other instances in the FIG. of the element having identical or similar structure and/or function may not have been redundantly labeled. A person having ordinary skill in the art will recognize based on the disclosure herein redundant and/or duplicated elements of the same FIG. Despite this, redundant labeling may be included where helpful in clarifying the structure of the depicted examples.

[0073] The Applicant(s) reserves the right to submit claims directed to combinations and sub-combinations of the disclosed examples that are believed to be novel and non-obvious. Examples embodied in other combinations and sub-combinations of features, functions, elements and/or properties may be claimed through amendment of those claims or presentation of new claims in the present application or in a related application. Such amended or new claims, whether they are directed to the same example or a different example and whether they are different, broader, narrower or equal in scope to the original claims, are to be considered within the subject matter of the examples described herein.

Claims

1. A structure, comprising: a first level and a second level, wherein the second level is a mezzanine; a first structural insulated panel (SIP) having a first height, wherein the first SIP forms a portion of a wall or a supporting wall of the mezzanine; a second SIP having a second height, the second height being at least twice the first height, wherein the second SIP forms a wall of an open space adjacent to the mezzanine, the open space extending from the first level and through the second level; and a third SIP forming at least a portion of a floor of the mezzanine, wherein the first SIP or the second SIP comprises: a first column and a second column, the first column being approximately parallel to the second column; and a first stress and load-bearing insulator between and adhered to the first column and the second column, wherein the third SIP comprises: a first joist and a second joist, the first joist being approximately parallel to the second joist; and a second stress and load-bearing insulator between and adhered to the first joist and the second joist, and wherein the second SIP comprises a girder integrated into the second SIP at a height of the mezzanine, the girder configured to support one or more additional joists.

2. The structure of claim 1, wherein the additional joists are for a future modification of the structure that converts the second level into an additional floor of the structure.

3. The structure of claim 1, wherein the first SIP is an external wall of the structure.

4. The structure of claim 1, wherein the second SIP is an external wall of the structure.
5. The structure of claim 1, wherein the first SIP is positioned beneath the floor of the mezzanine.
6. The structure of claim 1, wherein first SIP is positioned on top of the floor of the mezzanine.
7. The structure of claim 1, wherein the first insulator of the second SIP is further adhered to the girder.
8. The structure of claim 1, wherein the girder is attached to the first column or the second column of the second SIP.
9. The structure of claim 1, wherein the girder is supported by the first column and the second column of the second SIP.
10. The structure of claim 1, wherein the girder protrudes from a face of the second SIP towards an interior of the structure.
11. The structure of claim 1, wherein the girder protrudes from a face of the second SIP towards an exterior of the structure.
12. The structure of claim 1, wherein the second SIP comprises a joist opening adjacent to the girder, the joist opening configured to receive the one or more additional joists.
13. A structure, comprising: a first level and a second level, wherein the second level is a mezzanine; a first structural insulated panel (SIP); and a second SIP comprising a girder integrated into the second SIP, wherein a first set of walls comprising the first SIP at least partially define and support the mezzanine, and wherein the second SIP at least partially defines an open space adjacent to the mezzanine, the open space extending from the first level and through the second level.
14. The structure of claim 13, wherein the integrated girder is positioned at a top end of the SIP, at a bottom end of the SIP, or between the top end and the bottom end of the SIP.
15. The structure of claim 13, wherein the first SIP comprises: a first column and a second column, the first column being approximately parallel to the second column; a stress and load-bearing insulator between and adhered to the first column and second column; and an integrated girder supported by the first column and the second column, by the first column and the insulator, by the second column and the insulator, or by the first column, the second column, and the insulator.
16. The structure of claim 15, wherein the integrated girder is configured to support one or more joists.
17. The structure of claim 16, wherein the second SIP comprises a joist opening adjacent to the girder, the joist opening configured to receive the one or more joists.
18. A structure, comprising: a first level and a second level, wherein the second level is a mezzanine; and a structural insulated panel (SIP) comprising a girder integrated into the SIP, wherein the SIP at least partially defines or supports the mezzanine.
19. The structure of claim 18, wherein the girder supports a floor of the mezzanine.
20. The structure of claim 18, further comprising: a first set of walls that at least partially define and support the mezzanine; and wherein the SIP at least partially defines an open space in the structure adjacent to the mezzanine, the open space extending from the first level and through the second level.