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(54) **SEISMOPANEL WALL WRAPPING METHOD: A MEHOD FOR REINFORCEMENT OF STRUCTURES AND BUILDINGS WALLS AGAINST EARTHQUAKES AND OTHER OUTSIDE FORCES, BY APPLYING STEEL PLATES TO WALLS**

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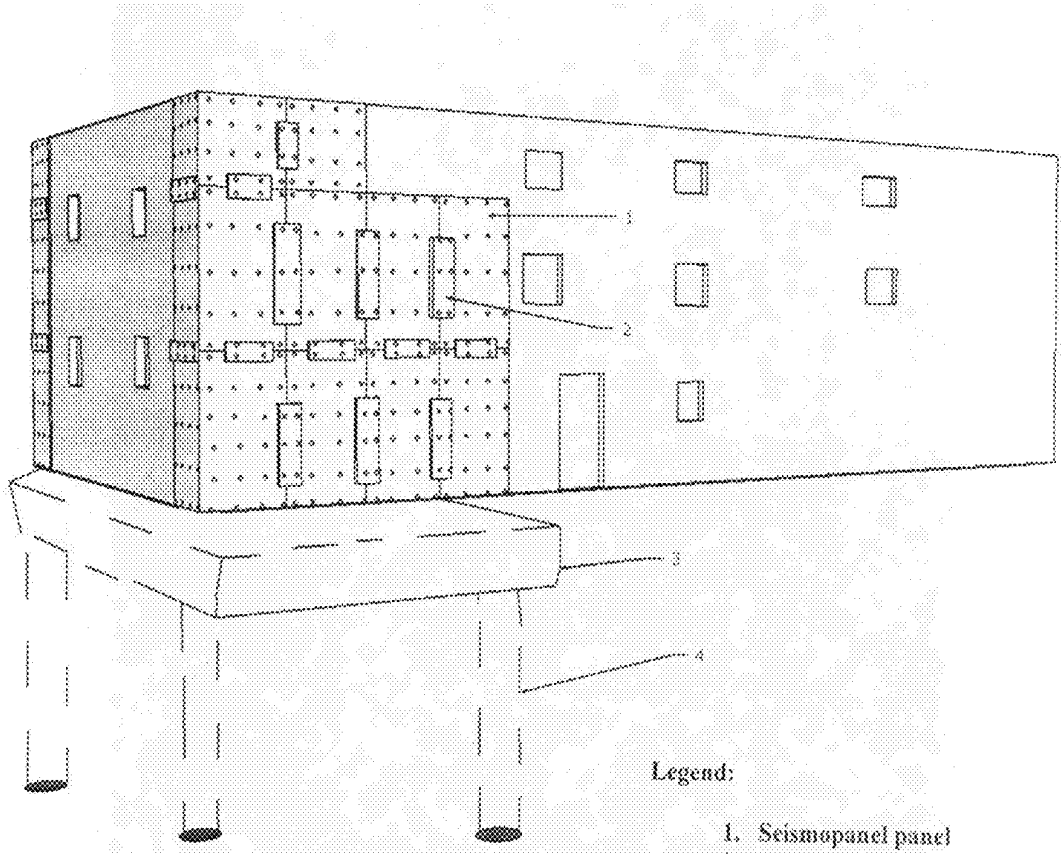
(57) **ABSTRACT**

A method of strengthening brick and other masonry structures and buildings, against earthquakes and other movements, by attaching steel plates on one or both sides of some part or all of the important load bearing walls, thereby converting them into effective shear walls.

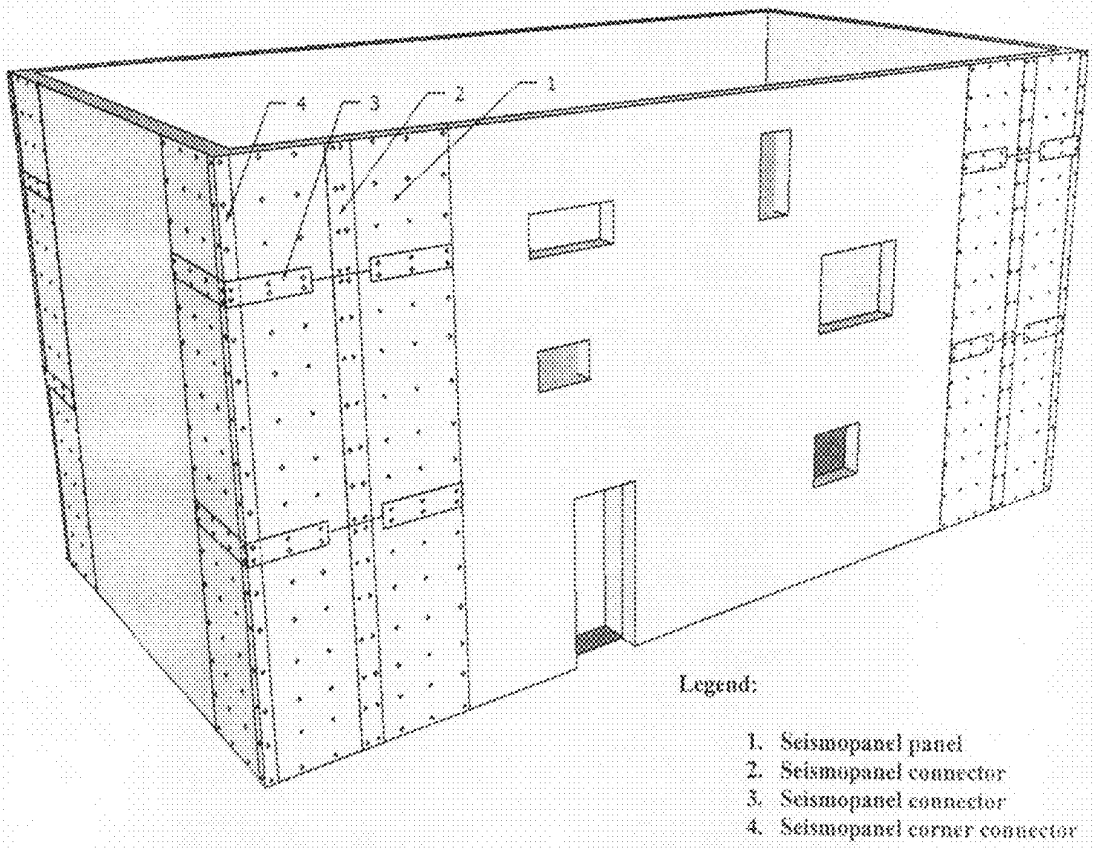


Legend:

1. Seismopanel panel
2. Seismopanel connector
3. Underground foundation
4. Underground pier

Seismopanel method on a building with good foundation and piers

Figure 1



Typical application of Seismopanel method on a building

Figure 2

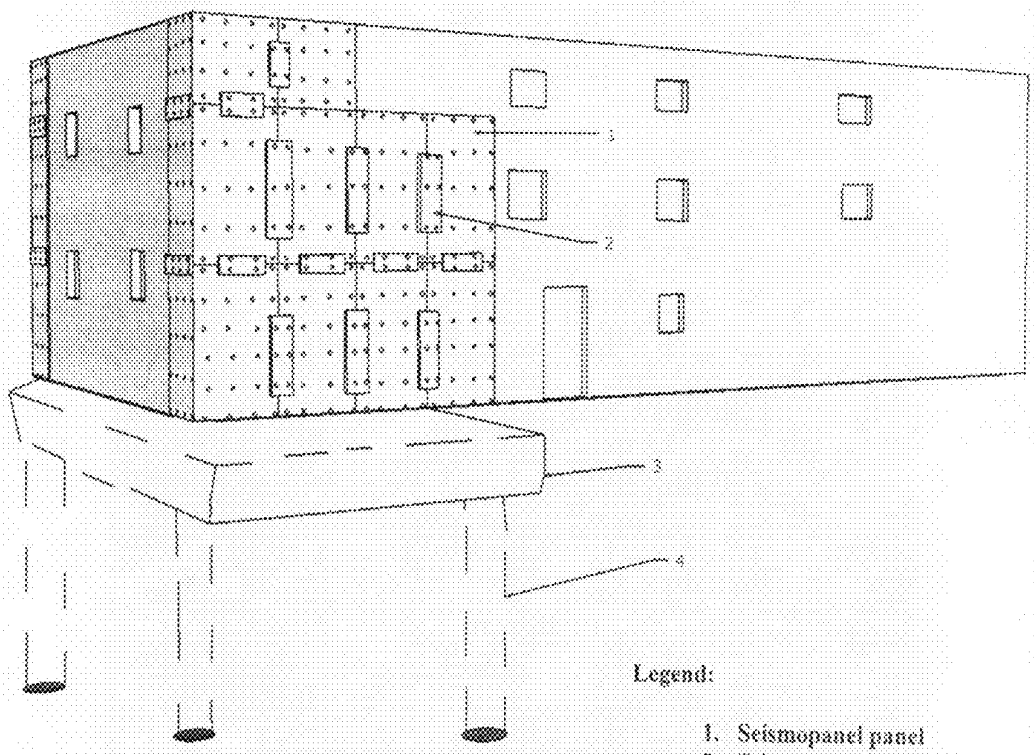


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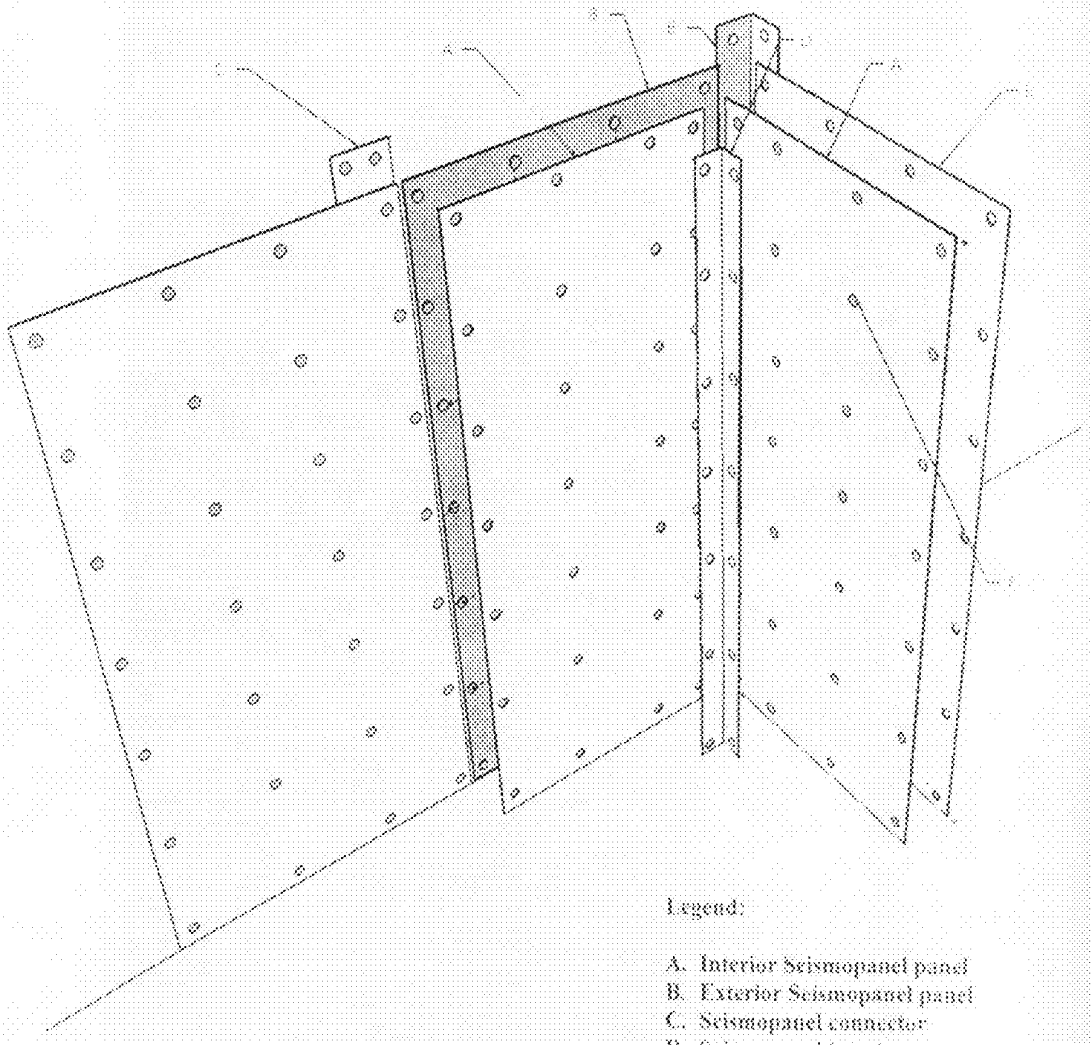
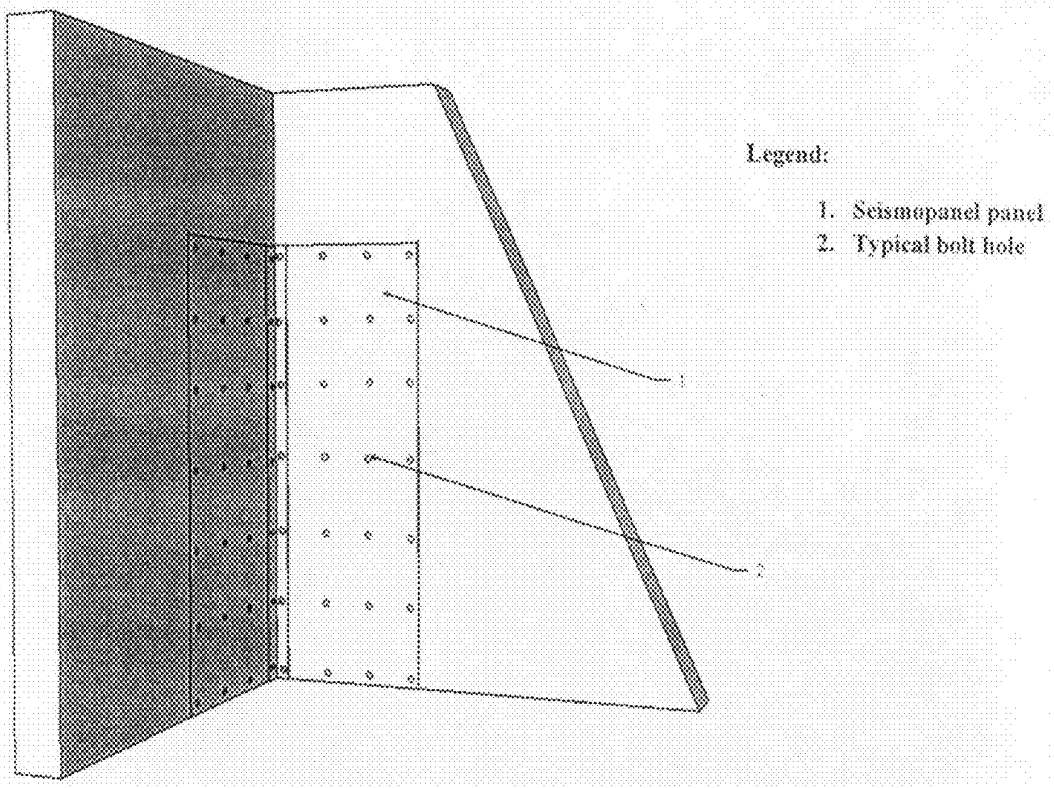
Figure 3



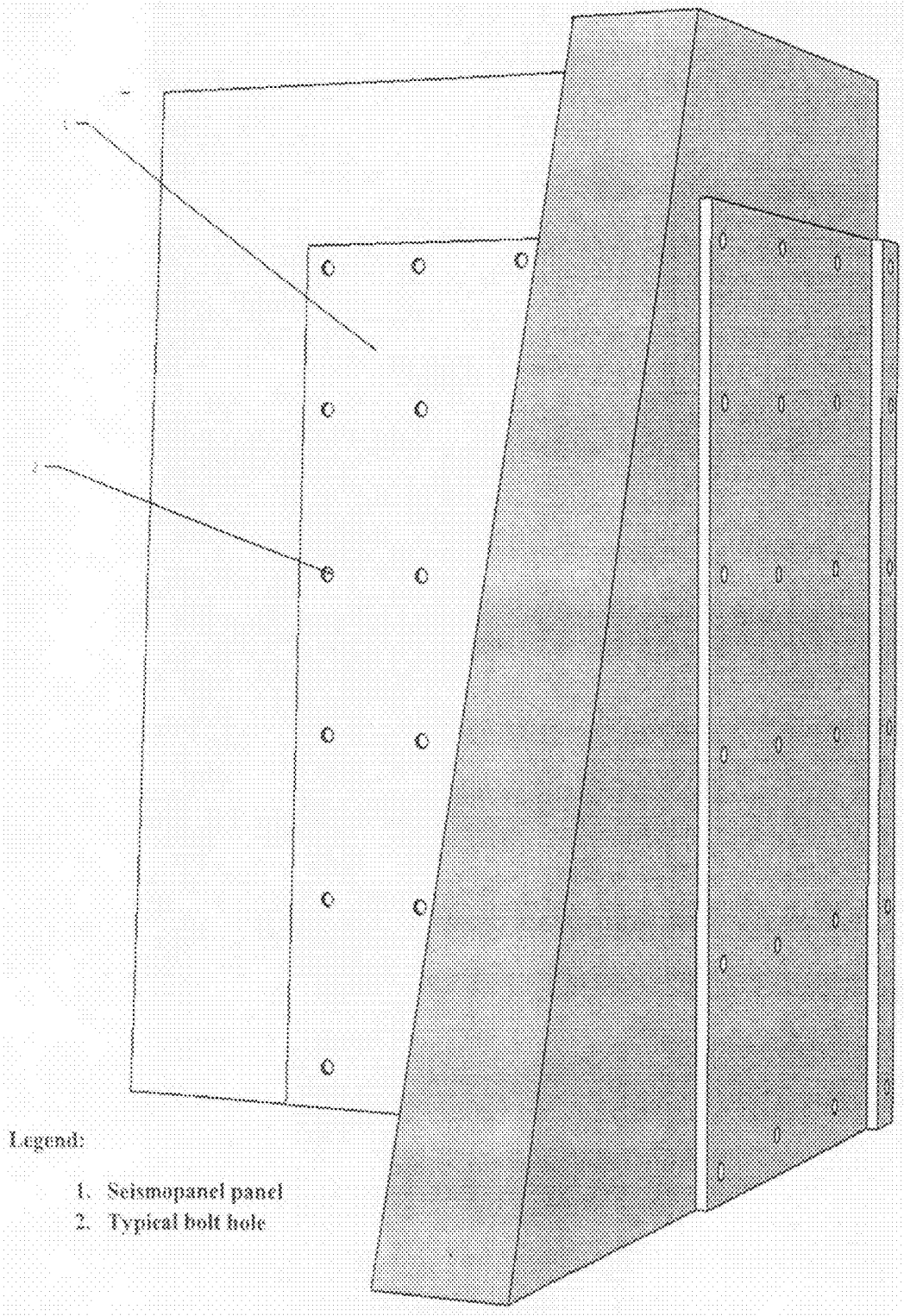
Seismopanel system kit

Figure 4



Seismopanel method at inside corner application

Figure 5



Seismopanel method at inside and outside corners application

SEISMOPANEL WALL WRAPPING METHOD: A MEHOD FOR REINFORCEMENT OF STRUCTURES AND BUILDINGS WALLS AGAINST EARTHQUAKES AND OTHER OUTSIDE FORCES, BY APPLYING STEEL PLATES TO WALLS

[0001] Seismopane wrapping method: A method for reinforcement of structures and buildings walls against earthquakes and other outside forces, by applying steel plates to walls.

LEGEND

[0002] URM: Un-reinforced masonry wall such as brick and/or cinder blocks and/or mortar and/or improperly applied concrete and/or low strength concrete and/or unreinforced concrete and/or any other masonry material.
EQW: earthquake and/or any ground movement and/or wind load and/or any air movement and/or any other external force.

PURPOSE OF INVENTION

[0003] The invention intends to provide a practical and relatively inexpensive solution for strengthening existing brick, cinder block, mortar, and other masonry material (abbreviated here as URM—any structure may have any or all of these building materials as part or all of its structure) structures against ground/base movement (mainly but not only earthquake) and other exterior forces (including but not only wind loads and other air movements) abbreviated here as EQW.

[0004] Structures (such as houses, buildings, schools and other public spaces, storages, warehouses, factories, and others) that were built using URM as their skeleton, walls, floors, and/or foundations are at risk. The risk may be especially great in high-density housing or business areas where many such buildings exist in close proximity to one another and where it is common for people to gather for work or in living spaces. The risk exists even if the structure's main supporting columns and beams are reinforced concrete and the URM material is only in-between these structural members. Such walls have a low shear value and are therefore unlikely to withstand any significant EQW, especially earthquakes.

[0005] If such structures experience significant EQW, the weak walls of URM are likely to crumble, bringing the structure down. If there is a skeleton structure of posts and beams, the structure will be left with no shear value to withstand the movements. This structure too is likely to collapse bringing down the floors and the roof above it.

[0006] This invention is a relatively cheap way of keeping the weak URM walls intact during a jolt, therefore keeping the whole structure intact (provided the foundation and other structural elements of the building are addressed).

DESCRIPTION OF INVENTION

[0007] "Seismopanel" is a method of using pre-fabricated steel plate system with a grid of holes for bolts. These plates interlock and wrap the weak URM walls from both sides to create a "crust" and sandwich the weak walls between the plates. By doing this, the integrity of the wall changes, and the newly created entity—the combined panels with the URM walls in between—becomes a good resistor of movement (shear wall). The steel panels give the wall the reinforcement of a steel reinforced concrete wall and prevent disintegration of the wall. In some cases where two sides of the wall cannot be wrapped due to existing conditions, the panels can be applied to only one side of the wall. This is usually less than ideal, but with proper design the addition of the panels to even one side of the URM wall can add significant stability to the wall and thus to the whole structure. "Seismopanel can be connected to the foundation of the structure by extending the panels into the foundation belt or by bolting into it.

[0008] Because every structure is different, a structural engineer will have to decide what walls of the building will have to be wrapped or covered using the "Seismopanel" method, in order to achieve optimal retrofit. The engineer will select the thickness of the plates and the bolt hole size from a material list available by the manufacturer. The engineer's design will also make the process more practical and economical because not all the load bearing walls of the structure may need to be wrapped.

[0009] The engineer will generally design applying the Seismopanel method at the four corners of the structure/building or at central locations in the middle. Some buildings will need a more creative design by the engineer.

APPLYING "SEISMOPANEL" WRAP METHOD AT THE BUILDING CORNERS

[0010] 1. Crew shall clear all obstacles and check for plumbing and electrical systems inside the walls. Workers may cut special holes and openings in the panels for obstacles such as electrical outlets and trim panels where needed, using blowtorch or other steel cutting tools.

[0011] 2. Two workers will lift and install the appropriate panel at the interior wall starting at the corner.

[0012] 3. The workers will then use a masonry hammer drill to drill through the four corner pre-drilled holes in the panels and through the URM wall, and set the four machine bolts. This will lay out the pattern for the exterior panel.

[0013] 4. Two workers on the outside will now install the exterior panel, lock the four bolts, and the rest of the drilling and bolting will take place.

[0014] 5. In some cases (especially at the corner post) shorter concrete bolts such as Simpson Tiden-HD concrete screws should be used to anchor directly into the concrete.

[0015] 6. Now that that segment of the wall is "sandwiched", the crew will continue the installation of the rest of the panels along that wall according the design of the engineer. All the other walls will be treated the same way, according to the engineer's design.

[0016] 7. Connector plates and corner pieces may be installed now in order to make the

[0017] "Seismopanel" system into one structural unit. Other methods of connecting the panels together may be used such as welding.

Materials

[0018] Seismopanel method uses steel, or galvanized steel, or coated steel, or coated galvanized steel or any other structural material with similar shape or size.

Dimensions

[0019] Seismopanel method uses various panel thicknesses allowing the engineer to choose the appropriate panel thickness for the specific application.

[0020] Seismopanel method uses various size panels allowing the builder to choose the right sizes that will fit the building/structure.

[0021] Seismopanel method uses panels with various size holes allowing the engineer to choose the right bolt sizes for each particular application.

[0022] Seismopanel method uses panels with various hole patterns allowing the engineer to choose the number of bolts per panel for each particular application.

BRIEF DESCRIPTION OF DRAWINGS

[0023] FIG. **1**: Typical application of Seismopanel interlocking system on a building.

[0024] FIG. **2**: Typical application of Seismopanel interlocking system on a building with connection to foundation work such as grade-beams, drilled piers, and/or concrete pads. This drawing shows how Seismopanel works best with a good foundation.

[0025] FIG. **3**: A drawing of a Seismopanel kit:

[0026] B. Exterior panel

[0027] C. Connector plate to connect two panels together

[0028] D. Interior corner piece

[0029] E. Exterior corner piece

[0030] F. Bolt holes for bolting panels together through the URM wall.

[0031] FIG. **4**: A drawing of a corner application.

[0032] FIG. **5**: A drawing of a corner application

What is claimed is:

1. A wall covering and wrapping method comprising: Covering or wrapping a structure's walls using steel panels on one or both sides of a wall, where such steel panels have grids of holes for bolting and connecting, in order to give the original structure a better rigidity and structural strength.

2. The wall covering and wrapping method of claim **1** wherein opposite plates are connected to each other using machine bolts that penetrate the wall from side to side and pull the plates towards each other thereby bringing them into tight contact with the wall.

3. The wall covering and wrapping method of claim **2** wherein some or all of the connecting bolts are eliminated in favor of anchor bolts or screws such as Simpson Tiden DH concrete screws or other kind of anchor or fastener or any rod or fastener set in adhesive such as epoxy, that anchor into the wall itself.

4. The wall covering and wrapping method of claim **1** wherein side-by-side plates are connected to each other using steel plate connectors with matching bolt holes, and utilizing the same bolts.

5. The wall covering and wrapping method of claim **1** wherein side-by-side plates are connected to each other using any other means such as welding, use of pins, adhesive, and/or "tongue and groove" system.

6. The wall covering and wrapping method of claim **4** wherein corner pieces are used to connect side by side panels that wrap around corners and/or over steps and bumps in the wall.

7. The wall covering and wrapping method of claim **6** wherein corner pieces are connected to each other using machine bolts or any other type of anchor bolt or screw or fastener as in claim **3** above, and/or use of welding, pins, adhesive, "tongue and groove" or any other way as in claim **5**.

8. The wall covering and wrapping method of claim **1** wherein each applied plate is square or rectangular shape.

9. The wall covering and wrapping method of claim **1** wherein each applied plate, connecting plate, and/or corner piece has a smooth surface (other than the bolt holes).

10. The wall covering and wrapping method of claim **1** wherein each applied plate, connecting plate, and/or corner piece has abrasive or textured surface.

11. The wall covering and wrapping method of claim **1** wherein each plate has a minimum of 4 bolt holes and as many number of bolt holes as needed.

12. The wall covering and wrapping method of claim **1** wherein each connecting plate, and/or corner piece has a minimum of no bolt holes and as many number of bolt holes as needed.

13. The wall covering and wrapping method of claim **1** wherein each plate, connecting plate, and/or corner piece has any other holes or brackets or fasteners or threaded holes for attaching other materials or members to it.

14. The wall covering and wrapping method of claim **1** wherein each plate, connecting plate, and/or corner piece has any other cosmetic look to it.

15. The wall covering and wrapping method of claim **1** wherein each plate, connecting plate, and/or corner piece has other means of connecting to other plates or brackets such as welding, use of pins, adhesives, cables, or mortar.

16. The wall covering and wrapping method of claim **1** wherein multiple plates can be installed on any side of a wall to increase strength whether it is side by side or one over the other.

17. The wall covering and wrapping method of claim **1** wherein bolt holes' diameter may be 3/16" to 2" diameter.

18. The bolt holes of claim **17** wherein any method can be used in creating the bolt holes such as drilling, punching, or during casting.

19. The wall covering and wrapping method of claim **1** wherein each plate, connecting plate, and/or corner piece has thickness 1/8" to 3".

20. The wall covering and wrapping method of claim **1** wherein the material used may be any kind of steel, metal or alloy, galvanized, coated, or all of them combined.

21. The wall covering and wrapping method of claim **1** wherein it can be also applied on one side of the wall only if necessary.

22. The wall covering and wrapping method of claim **21** wherein the plates will be bolted using machine bolts that will penetrate to the other side of the wall and will be locked there using sufficient washers and nuts.

23. The wall covering and wrapping method of claim **21** wherein the plates will be bolted using other kinds of bolts such as Simpson Tiden-HD, or other types of anchor bolts, or any other type of fastener such as threaded rod set in adhesive such as epoxy.

24. The wall covering and wrapping method of claim **1** wherein the plate, connecting pieces and bolts can be installed in any combination, pattern, shape, and size.

25. The wall covering and wrapping method of claim **1** wherein the plates, connectors, and bolts, can be installed using any appropriate tool, machine, equipment and number of people.

26. The wall covering and wrapping system of claim **1** wherein the plates and connecting parts and bolts can be cut to fit the wall size, shape, openings, and anything that is attached to or mounted on the wall.

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