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(54) **METHODS AND APPARATUSES FOR SHAPING CONCRETE SLAB-ON-GROUND FOUNDATIONS**

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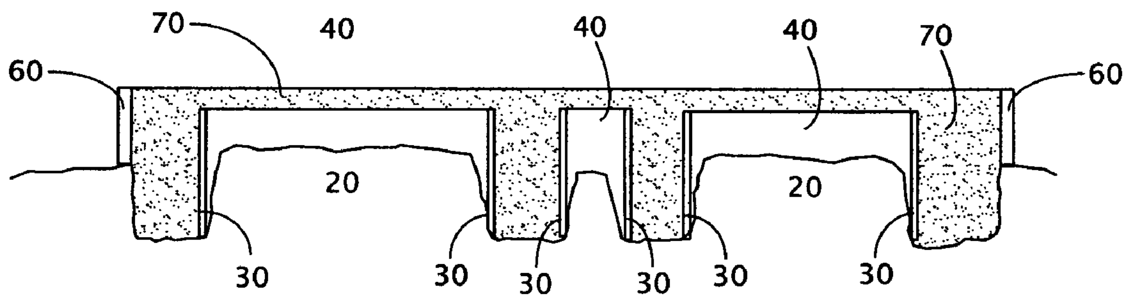
(57) **ABSTRACT**

A method and apparatus for improving the shape of the underside of ribbed concrete slab-on-ground foundations, the foundation having earthen pads and trenched ribs, that includes positioning one or more shoring panels adjacent to at least one of the earthen pads along at least part of one vertical side of a rib, wherein the shoring panels are made from expanded polystyrene treated with a termiticide, back-filling sand in the void between the shoring panels and the earthen pad, dragging a screed across the top portion of the shoring panels to smooth the backfilled sand over the earthen pads, and pouring concrete within a perimeter defined by outer forms and over the earthen pads, backfilled sand, shoring panels, and trenched ribs. The ability to cut and form the panels provides a wide range of structurally efficient cross-sectional shapes with the concrete not possible with traditional methods.



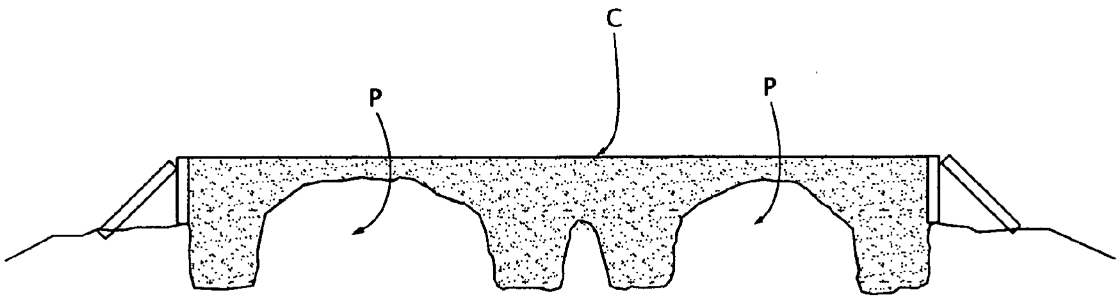


Fig. 1

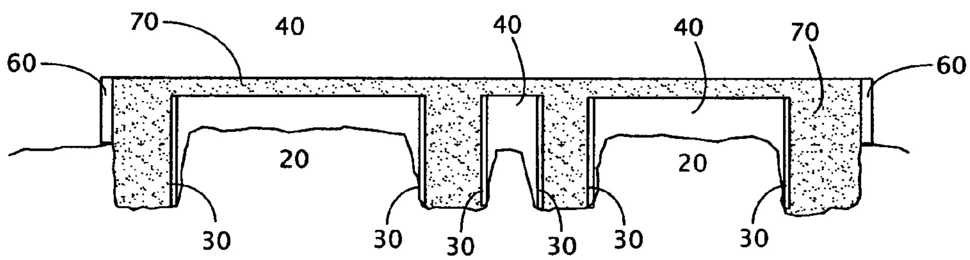


Fig. 2

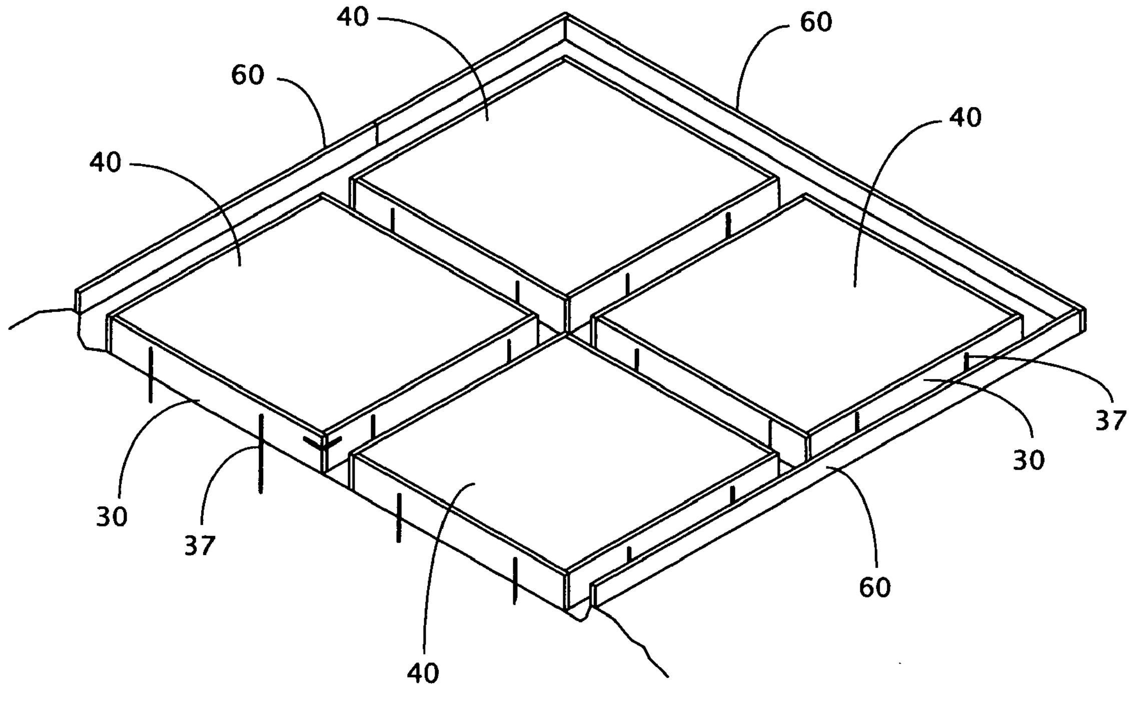


Fig. 3

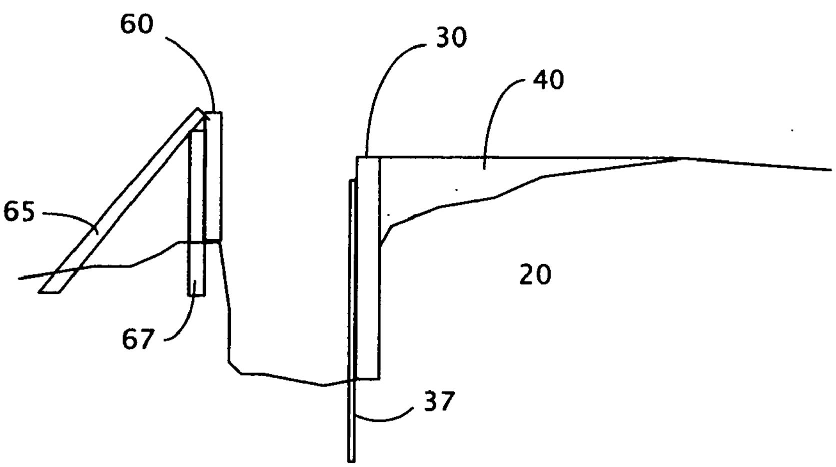


Fig. 4

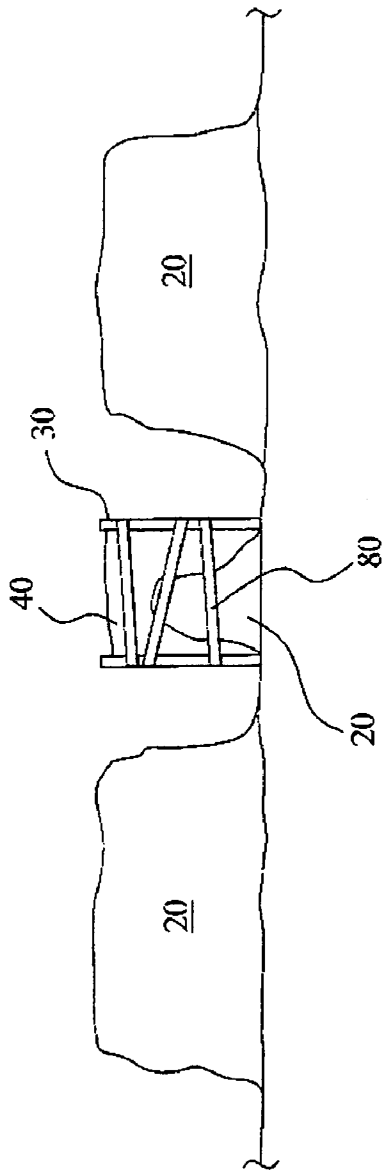


FIG. 5

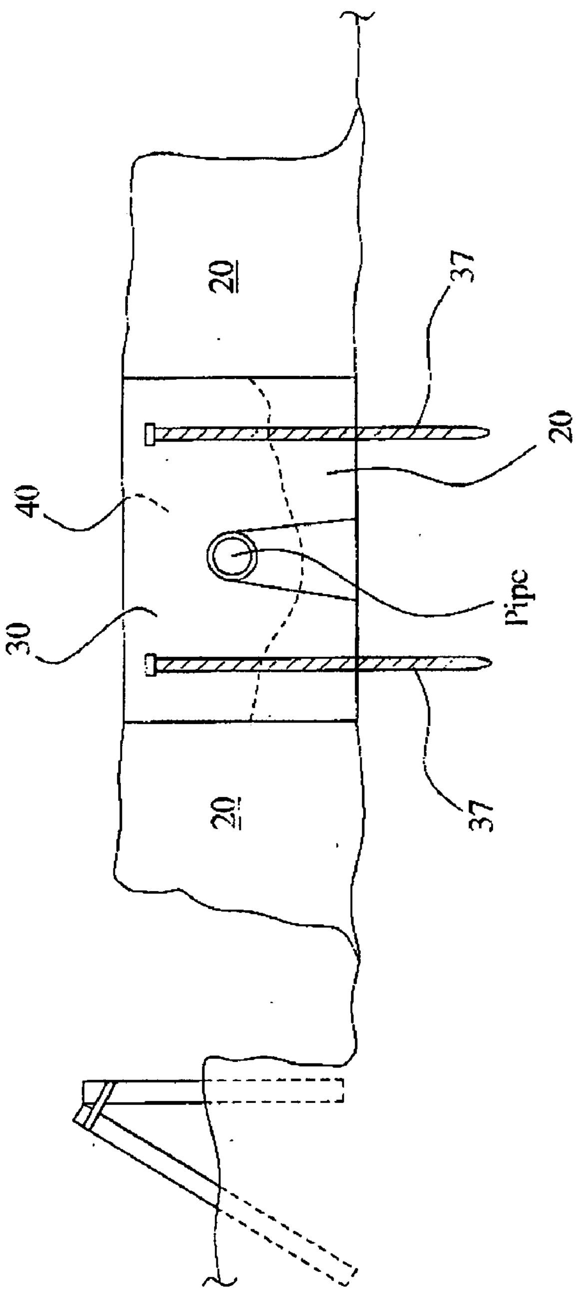


FIG. 6

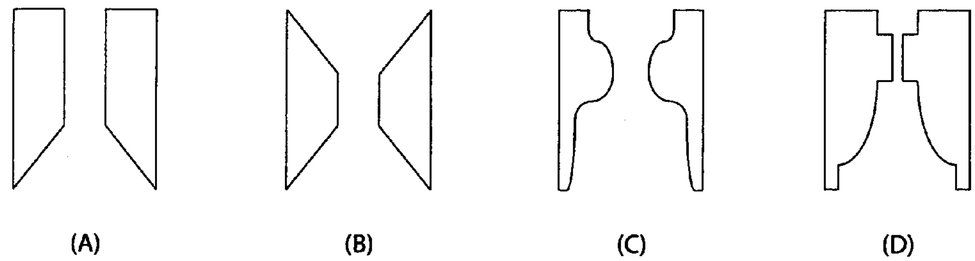


Fig. 7

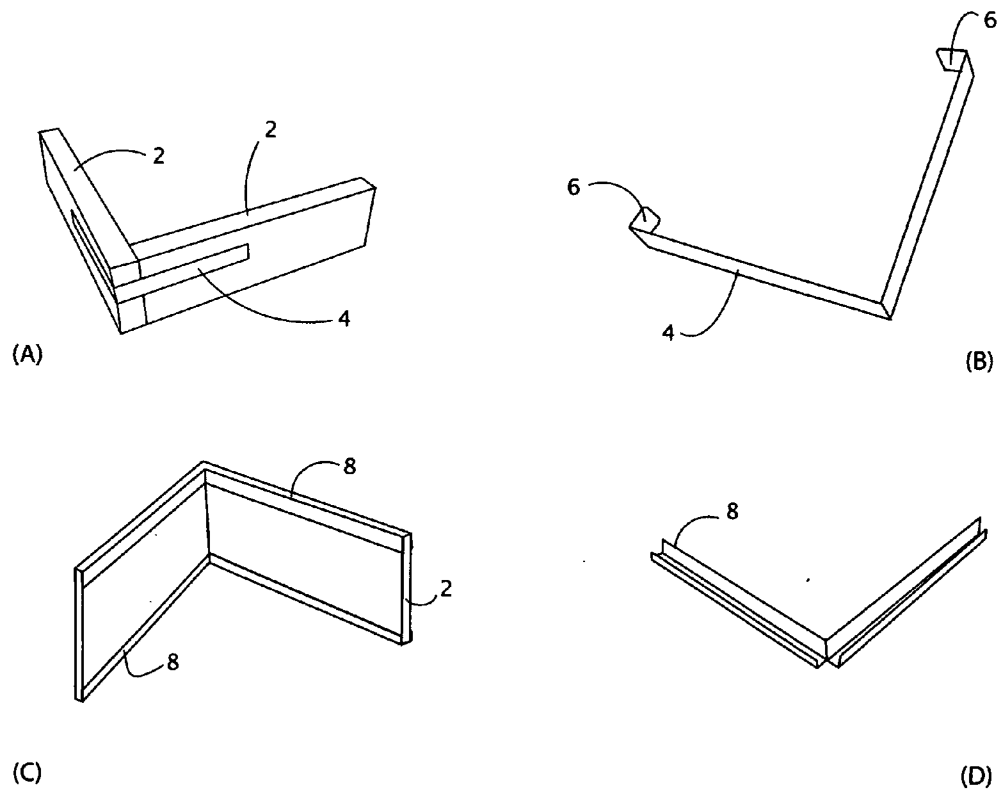


Fig. 8

METHODS AND APPARATUSES FOR SHAPING CONCRETE SLAB-ON-GROUND FOUNDATIONS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 60/673,464 entitled "Concrete Slab-on-Ground Rib Form," filed Apr. 21, 2005.

FIELD OF THE INVENTION

[0002] This invention generally relates to slab-on-ground concrete foundations for buildings, and more specifically, to methods and apparatuses for improving the shape of the underside of ribbed concrete slab-on-ground foundations.

BACKGROUND OF THE INVENTION

[0003] The foundation is the first piece of a home to be constructed and creates the base for the rest of a home's components. A foundation anchors a house to the earth, holding it up and, just as importantly, holding it down. Surprisingly, houses are as likely to blow away in a windstorm as they are to sink into the ground. But foundations do more than just hold a house: they must resist water, ice, fungus, insects, and soil gases, and they have to stand up to soil pressures that can exert far more force than the weight of the house itself. When they are working well, foundations escape notice, quietly doing their thing below grade. But when they begin to fail, they can be the source of trouble and expense.

[0004] There are three types of foundations that are commonly used in the United States: full-height basement, crawlspace, and slab-on-grade. Builders make decisions about which type of foundation to use by gauging cost, market demand, and soil and weather conditions.

[0005] Slab-on-grade foundations are a building practice whereby the concrete slab that is to serve as the foundation for the structure is formed from a mold dug into the ground. The concrete is then poured into the mold, leaving no space between the ground and the structure. This type of construction is most often seen in warmer climates, where ground freezing and thawing is less of a concern and where there is no need for heat ducting underneath the floor.

[0006] The advantages of the slab technique are that it is relatively cheap and sturdy, and is considered less vulnerable to termite infestation because there are no hollow spaces or wood channels leading from the ground to the structure. The disadvantages are the lack of access from below for utility lines, a tendency to transmit cold upward in areas where ground temperatures fall significantly, and a very low grade elevation that may expose the building to flood damage in even moderate rains.

[0007] Where the soils are highly expansive, builders for its reliability and relative cost savings often use a monolithic post-tensioned ribbed slab-on-ground foundation. A ribbed slab-on-ground foundation is produced by digging trenches in the soil creating ribs with a crude rectangular cross section, that typically flair out considerably due to the nature of the unrestrained soils inability to create sharp crisp corners and edges. These ribs create a grid pattern as viewed from above. The loose dirt created by the trenching process is then mounded up between the ribs creating horizontal supporting surfaces or pads.

[0008] Surprisingly, horizontal supporting surfaces in slab-on-ground foundations are not formed with wood or steel but rather are formed with the earth; therefore, specific tolerances for this type of construction have not been developed. The difficulty of loose or unrestrained earth to be effectively formed into shapes with tighter tolerances causes more expensive material such as concrete to be used, thus driving up the cost of housing and other buildings.

[0009] The problem is illustrated in **FIG. 1**. Instead of sharp crisp corners and edges being defined by the earthen pads and grid cut trenches, the pads "P" are often crudely sloped near the ribs. This creates considerable waste and expense as the poured concrete "C" for the foundation is used to fill these voids where the earth should be. Instead of expensive concrete, the pads should be shaped before the pour with less expensive material such as sand to form consistently shaped parallelepiped pads with flat, smooth surfaces.

[0010] Accordingly, there is a need for improved methods and apparatuses for shaping the underside of ribbed concrete slab-on-ground foundations to eliminate the constraints, concrete waste, and design drawbacks seen in the prior art and described above.

SUMMARY OF THE INVENTION

[0011] The present invention relates to slab-on-ground concrete foundations for buildings, and more specifically, to methods and apparatuses for improving the shape of the underside of ribbed concrete slab-on-ground foundations.

[0012] In one embodiment, the invention includes the steps of digging trenches in the ground to form one or more earthen pads with ribs; positioning one or more shoring panels adjacent to at least one of the earthen pads along at least part of one vertical side of a rib; backfilling sand in the void between the shoring panels and earthen pad; providing an outer perimeter form around the exterior of the earthen pads; and pouring concrete within the perimeter defined by the outer forms and over the earthen pads, backfilled sand, shoring panels, and trenched ribs. If desired, the shoring panels may be supported in place with one or more stakes driven into the ground. The method of this invention can also include dragging a screed across the top portion of the shoring panels to smooth the backfilled sand over the earthen pads. A vapor barrier made from 6-mil or 12-mil thick polyethylene sheeting may also be added over the earthen pads, backfilled sand, and shoring panels before the concrete is poured. In another embodiment, the invention describes the use of temporary or permanent spacers placed between the earthen side of a pad and the vertical face of a shoring panel (or between two shoring panels).

[0013] As described and claimed herein, the shoring panels are made from any rigid material capable of maintaining its stiffness long enough for the installation process, inspection, placement of concrete, and the initial curing or set of the concrete. In one embodiment, the shoring panels are made from a lightweight rigid foam. The shoring panels may also be made from a high density foamed synthetic resin such as expanded polystyrene, extruded polystyrene foam, polyurethane foam, or a foamed phenolformadehyde or like resin. Most preferably, the shoring panels are made from expanded polystyrene treated with a termiticide. The shoring panels may be shaped to form an efficient cross-sectional profile or shape that will mold the concrete into various shapes

[0014] When two or more shoring panels are positioned adjacent to each other, the invention provides several methods for connecting the corners of the adjacent shoring panels. One embodiment comprises a band of adhesive fabric tape, metal banding, or plastic tape or banding being applied to the shoring panels. Another embodiment provides a metal strap, windstorm strap, or other material strap applied to the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad. Yet another embodiment includes a metal or other material "J" channel cut on one vertical plane and one horizontal plane, leaving the remaining vertical plane intact, bending at this point to any angle, and placing over and or under the horizontal edges of the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

[0015] Accordingly, several objects and advantages of the invention are:

[0016] (a) to provide a way to restrain the soil on the edge of the pad from falling to the bottom of the trench from gravity or when workmen step near the edge during placement before the concrete has cured;

[0017] (b) to provide support and stability to narrow earthen pads normally unable to support themselves;

[0018] (c) to provide shoring for the trenches that make the ribs;

[0019] (d) to provide a better way to control slab thickness reducing the possibility of unsightly hydration cracks;

[0020] (e) to provide a straight horizontal edge that may be used as a screed for the top of the pad to level the loose fill of the horizontal supporting surface;

[0021] (f) to provide tighter tolerances increasing the predictability of slab performance;

[0022] (g) to provide a more uniform slab thickness;

[0023] (h) to provide a more predictable quantity of material needed for construction;

[0024] (i) to provide a wide range of structurally efficient cross-sectional shapes not possible with traditional methods;

[0025] (j) to provide a more orderly professional-looking jobsite; and

[0026] (k) to provide shoring for loose soil where pipes and/or utilities cross a rib.

[0027] The foregoing has outlined rather broadly the features and technical advantages of the present invention so that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter, which form the subject of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiments disclosed might be readily used as a basis for modifying or designing other methods or apparatuses for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention, and, together with the description, serve to explain the principles of the invention. In the drawings:

[0029] **FIG. 1** is a cross section view of a prior art concrete ribbed foundation showing the relationship of the earthen pads and concrete without the benefit of the present invention;

[0030] **FIG. 2** is a cross section view of a concrete ribbed foundation showing the relationship of the earthen pads, shoring panels, sand, and concrete;

[0031] **FIG. 3** is a perspective view of a concrete ribbed foundation showing the perimeter wooden forms, shoring panels, and earthen pads leveled with sand;

[0032] **FIG. 4** is a partial cross sectional view of **FIG. 3** showing a perimeter wooden form and a staked shoring panel;

[0033] **FIG. 5** is cross section of a small earthen pad illustrating the shoring panels being held in place with tape banding;

[0034] **FIG. 6** is a cross section showing the shoring panel installed around a protruding pipe and retaining the loose fill material of the protruding pipes trench.

[0035] **FIGS. 7 A**, B, C, and D are cross section views of various shoring panel configurations; and

[0036] **FIGS. 8 A**, B, C, and D are perspective views of various methods of joining the corners of adjacent shoring panels.

[0037] It is to be noted that the drawings illustrate only typical embodiments of the invention and are therefore not to be considered limiting of its scope, for the invention will admit to other equally effective embodiments.

DETAILED DESCRIPTION OF THE INVENTION

[0038] In general, the present invention relates to methods and apparatuses for improving the shape of the underside of ribbed concrete slab-on-ground foundations. One or more shoring panels may be used to make a below grade lost-form for receiving a flowable material to form ribs in a slab-on-ground monolithic concrete structure. More specifically, a foam lost-form panel generally running the length and height of the vertical portion of the rib offers better control of the shape of the underside of the monolithic slab-on-ground foundation. As such, the present invention relates to a construction system utilizing so-called lost forms, i.e. a formwork for retaining loose fill and casting of concrete made up of walls or panels which are left in place once the concrete hardens.

[0039] **FIG. 1** is a cross section view of a prior art concrete ribbed foundation showing the relationship of the earthen pads and concrete without the benefit of the present invention. As seen here, instead of sharp crisp corners and edges being defined by the earthen pads and grid cut trenches, the pads "P" are often crudely sloped near the ribs. This creates considerable waste and expense as the poured concrete "C" for the foundation is used to fill these voids where the earth should be.

[0040] Turning now to **FIG. 2**, there is shown a cross section view of a concrete ribbed foundation **10** illustrating the relationship of the earthen pads **20**, shoring panels **30**, sand **40**, vapor barrier **50** (not shown), perimeter wooden forms **60**, and concrete **70**.

[0041] As seen here, the earthen pads **20** are made through traditional trenching processes. The trenches or ribs are either dug by hand or by a trenching machine per the certifying engineer's drawings showing beam width and beam depth and the location of any tension cables. Typically the ribs are excavated to form a rough rectangular shape in the ground. The ribs are usually designed in a grid pattern under the finished slab, per the Post-Tensioning Institute's standard requirements. The horizontal plane between the rib excavations is called the pad or cushion and is built up to form the underside of the slab portion. Normally, the upper portion of the rib excavation flares out to prevent dirt from caving into the rib cavity. The pad cushion is crudely leveled by hand, erring on the side of exceeding the minimum design dimensions.

[0042] The shoring panels **30** are made of any rigid material capable of maintaining its stiffness long enough for the installation process, inspection, placement of concrete, and the initial curing or set of the concrete. The preferred material is lightweight rigid foam because it is easy to cut in the field with simple hand tools and is easy to handle and transport. The shoring panels **30** preferably are formed with a high density foamed synthetic resin such as expanded polystyrene, extruded polystyrene foam, polyurethane foam, or a foamed phenolformadehyde or like resin. Even more preferably, the shoring panels **30** are made of expanded polystyrene or EPS that is treated with a termiticide, such as "PERFORM GUARD" EPS geofoam, a termite resistant expanded polystyrene insulation material available from R-Control Building Systems, AFM Corporation in Excelsion, Minn., and its suppliers. These pretreated foam boards are not just sprayed with the termiticide on the exterior surfaces, but instead are treated with the termiticide throughout, allowing the panels to be cut at will without compromising the termite resistant treatment.

[0043] Of course, the shoring panels **30** may be made of other materials such as corrugated cardboard, corrugated plastic such as COROPLAST (and similar names in Australia), cement fiber board, HOMASOTE, Gypsum sheeting, plywood, Oriented strand board, MASONITE, sheet metal, expanded sheet metal, welded wire fabric or wire mesh with fabric similar to that of silt fence, or any semi-rigid material capable of retaining its shape during the process stated above.

[0044] As is discussed in more detail below, expanded polystyrene can also easily be given an efficient cross-sectional profile or shape that will mold the concrete into shapes such as a "C" shape, "L" shape, convex shape, or concave shape. In fact, the shape configurations are endless. The shape of the protrusion created by the shoring panels **30** can be adjusted to fit conditions. For example, a cross section may show a 14" width on the bottom being reduced to 6" in the center and 10" at the top. The protrusions may also touch from one side to the other creating a void in the concrete similar to a lightening hole in an aircraft's wing spar or web of a structural truss. The protrusion may also be only on one side. Likewise, the panels can be designed with a trapeze type device to hold tension cables in place during the pour.

[0045] Typically, additional sand is placed within the perimeter removable forms and leveled, prior to any installation of under-slab utilities or trenching has begun providing the additional fill to achieve the desired pad height.

[0046] The sand, trenching spoils, or loose fill **40** is removed from the trenches and temporarily mounded on the pads to be leveled to after panels are installed used to backfill the earthen pads **20** to form more uniform pads and to cut down on concrete waste. Excess fill material is then removed and placed around the perimeter of the foundation to be used as grading material for the yard. More specifically, the concrete slab-on-ground rib form is made up of the spaced-apart pads and their vertical side panels, which define the cavity of the rib. The panels are placed in the excavated trenches and cut to length around all four sides of the pad or can be installed only where the pad material is to loose to retain a desired pad shape. The panels are trimmed to the proper height and then used as screeds for the pad.

[0047] All slabs in living areas or interior areas should contain a suitable vapor barrier **50** (not shown). For heavy-duty protection, a 6-mil or 12-mil thick polyethylene sheeting overlapping at least 6" at all seams and taped to prevent slippage and paths for moisture migration is used. Sometimes a 2" thick base of fine sand is placed over the vapor barrier **50** to protect it during placement of the concrete.

[0048] Traditionally, to define a perimeter of a given area to be poured with concrete, a "form board" or perimeter-stopping system using temporary forms is installed. One such temporary form is made of two inch by twelve inch nominal thickness (lumber dimension) boards. The boards are temporarily installed with form stakes about the edges of the slab. The top edge of the boards is then set to the desired slab height by laser beam, builder's level, or other appropriate site instrument. The concrete is then poured using the top edge of the perimeter forms as a reference. Here, perimeter wooden forms **60**, made of 2"×12" lumber, are shown. Of course, the perimeter of the slab may be formed with other conventional above ground material such as TIMBERSTRAND laminated strand lumber (LSL) edge form by Weyerhaeuser, metal forms, or other reusable material that is removed after the slab has cured.

[0049] Cementitous material, such as concrete, preferably having a good workability, is poured between the perimeter wooden forms **60**, and the concrete **70** gravitates or flows above the earthen pads **20** and fill sand **40**, over the shoring panels **30**, and into the ribbed trenches and associated recesses. The form is filled to the top and finished, and the concrete is cured to a solidified state.

[0050] When comparing **FIGS. 1 and 2**, there is a huge cost saving produced from using the present invention. Instead of expensive concrete, the pads are shaped before the pour with less expensive material such as sand to form consistently shaped parallelepiped pads with flat, smooth surfaces. This is particularly apparent when one considers that concrete costs about $700 per 10 yards, while sand costs about $52 per 10 yards of material.

[0051] **FIG. 3** is a perspective view of a concrete ribbed foundation showing the perimeter wooden forms **60**, shoring panels **30**, and earthen pads **20** leveled with sand **40**. As shown here, the shoring panels **30** can encircle the earthen pads **20** on all four sides, on less than all four sides, partially along only one side, or any combination thereof. One or more support stakes **37** may be driven into the ground to support the shoring panels **30**. The shoring panels **30** may be connected at the corners by a number of methods described in connection with **FIGS. 8 A**, B, C, and D.

[0052] **FIG. 4** is a partial cross sectional view of **FIG. 3** showing a perimeter wooden form **60** and a shoring panel **30**. The perimeter wooden form **60** is temporarily held in place with stakes **65** and **67**. The shoring panel **30** is held in place with one or more stakes **37**.

[0053] The panels **30** vertical dimension will be set to the underside of the desired slab thickness. This can be done by measuring the dimension from the surface on which the panel **30** rests to the top of the form **60** height less the slab thickness, or placing a taller panel vertically on the surface on which it will rest and measuring down the desired slab thickness from a string running from the top of one side to the other of the forms, snapping a chalk line, and trimming the height while in place to the perfect height. The panel does not have to rest in the bottom of the trench; it can be placed at ground level above the trench bottom.

[0054] Turning now to **FIG. 5**, there is shown one method of holding the shoring panels in place. Along with support stakes, the shoring panels **30** may be held in place by a number of methods but the preferred method is running a band of "duct tape" or other tape **80** around all four sides. This method is most often used for small earthen pads **20**. If desired, a temporary block or spacer can be inserted between the opposing panels for added support and removed during the concrete placement process. The top portion of the panel can be used as a flat surface and guide for backfilling the pad side of the panel with sand **40** or other fill and dragging a screed across the top, smoothing the pad surface. A vapor barrier **50** can now be draped over the pad (overhanging the panel) and a band of duct tape or other banding material installed. The earth walls of the trench and the backfilled pad will act as support for the panels as the concrete is placed.

[0055] **FIG. 6** is a cross section showing the shoring panel installed around a protruding pipe and retaining the loose fill material of the protruding pipes trench. The pipe is a typical plumbing pipe placed below the concrete slab, but above the bottom of the trench. As such, the shoring panels can be used only where needed, such as where the earthen pad has been most disturbed by trenching.

[0056] **FIGS. 7 A**, B, C, and D are cross-section views of various shoring panel **30** configurations. As seen therein, the panels can be beveled at the bottom edge to give the rib a wider, belled effect increasing the load-bearing surface while reducing the width of the remaining portion of the rib. This significantly reduces material cost while greatly improving control of tolerances and performance. The panels can also be formed to make a variety of shapes including but not limited to "I" shaped, "T" shaped, "L" shaped, "C" shaped, or "F" shaped. These shapes may add lateral strength to deeper or taller ribs subjected to side loads such as sloped terrain or shifting soils.

[0057] **FIGS. 8 A**, B, C, and D are perspective views of various methods of joining the corners of adjacent shoring panels. For example, **FIG. 8A** shows a corner strap (**4**) made from a heavy gauge sheet metal strap such as a readily available windstorm strap. Other material such as nylon, plastic, copper, or a material that can be formed and has a slight spring action can be used for the strap. **FIG. 8B** shows corner strap (**4**) bent slightly past 90°, approximately in the center giving it a spring or clamping action, with tabs (**6**) being bent at 90°, approximately the same distance in from the end as the thickness of the panel that it will be penetrating. The panels are installed and the corner strap (**4**) is opened slightly with the center inside corner resting firmly on the panels (**2**) intersection and the tabs (**6**) pushed into the panels (**2**) to hold it in place. **FIG. 8C** shows panel (**2**) with a metal "J" channel (**8**) to stiffen the horizontal edge. Channel (**8**) can also be cut with hand tools to form a corner connection. **FIG. 8D** shows a metal "J" channel (**8**) cut on one vertical plane and cut on the horizontal plane leaving the remaining vertical plane to tie the panels (**2**) together.

[0058] Alternatively, the installer may simply lay the panels at the perimeter of the pad, single or in layers to the desired height, and fill in the center with sand. The panels or borders can be staked in place. Depending on the size of the pad and the force required to restrain the loose fill, another alternative to the corner connections listed above is to band the panels with reinforced adhesive tape, or plastic or metal banding as used in the shipping and freight industry.

[0059] While not shown in specific drawings, it will be understood that within the spirit of the invention, corner connectors other than straight right angled corner connectors can be utilized to construct forms of various shapes. For example, the corner connectors can be T-shaped, X-shaped, or Y-shaped, to enable formwork to be constructed for interior and intersecting pipes and other structures. In addition, the corner-connectors need not necessarily be right angled. They can be of any angle from virtually 0 degrees to 360 degrees to accommodate various construction requirements.

[0060] When used, the present invention provides a way to restrain the soil on the edge of the pad from falling to the bottom of the trench from gravity or when workers step near the edge during placement before the concrete has cured. More importantly, the pads can be shaped before the pour with less expensive material such as sand to form consistently shaped parallelepiped pads with flat, smooth surfaces. Not only does this invention provide a provide a more orderly professional-looking jobsite, the use of the shoring panels reduces concrete costs tremendously, provides a better way to control slab thickness, and gives the builder a more predictable quantity of material needed for construction. As another benefit, the ability to cut and form the panels provides a wide range of structurally efficient cross-sectional shapes with the concrete not possible with traditional methods.

[0061] Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions, and alterations could be made herein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A method for improving the shape of the underside of ribbed concrete slab-on-ground foundations comprising the steps of:

digging trenches in the ground to form one or more earthen pads with ribs;

positioning one or more shoring panels adjacent to at least one of said earthen pads along at least part of one vertical side of a rib;

backfilling sand in the void between said shoring panels and earthen pad;

providing an outer perimeter form around the exterior of the earthen pads; and

pouring concrete within the perimeter defined by the outer forms and over said earthen pads, backfilled sand, shoring panels, and trenched ribs.

2. The method of claim 1, wherein said trenches are dug by hand.

3. The method of claim 1, wherein said trenches are dug by a trenching machine.

4. The method of claim 1, wherein said shoring panels are made from any rigid material capable of maintaining its stiffness long enough for the installation process, inspection, placement of concrete, and the initial curing or set of the concrete.

5. The method of claim 1, wherein said shoring panels are made from a lightweight rigid foam.

6. The method of claim 1, wherein said shoring panels are made from a high density foamed synthetic resin such as expanded polystyrene, extruded polystyrene foam, polyurethane foam, or a foamed phenolformadehyde or like resin.

7. The method of claim 1, wherein said shoring panels are made from expanded polystyrene treated with a termiticide.

8. The method of claim 1, wherein said backfilled sand comprises fine sand, trenching spoils, or loose fill.

9. The method of claim 1 further comprising the step of:

adding a vapor barrier over said earthen pads, backfilled sand, and shoring panels before the concrete is poured.

10. The method of claim 9, wherein said vapor barrier is made from 6-mil or 12-mil thick polyethylene sheeting.

11. The method of claim 1 further comprising the step of:

supporting said shoring panels adjacent said earthen pads with a stake driven into the ground.

12. The method of claim 11, wherein said stake comprises steel re-bar, wood, sheet metal, composite material, or plastic or rigid pipe.

13. The method of claim 1 further comprising the step of:

shaping said shoring panels to form an efficient cross-sectional profile or shape that will mold the concrete into various shapes.

14. The method of claim 13, wherein said profile or shape comprises a "C" shape, "L" shape, "I" shape, "T" shape, "F" shape, convex shape, or concave shape.

15. The method of claim 1, wherein two or more shoring panels are positioned adjacent to each other and are used to form virtually any angle from 0 to 360 degrees.

16. The method of claim 15 further comprising the step of:

connecting the corners of the adjacent shoring panels.

17. The method of claim 16, wherein the step of connecting the corners of the adjacent shoring panels comprises

applying a band of adhesive fabric tape, metal banding, or plastic tape or banding to the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

18. The method of claim 16, wherein the step of connecting the corners of the adjacent shoring panels comprises

applying a metal strap, windstorm strap, or other material strap to the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

19. The method of claim 18

wherein said strap has two ends, each end to be bent more or less the same distance in from each end as the thickness of the shoring panels at right angles in the same direction creating tabs; and

wherein said strap is then bent preferably in the middle at a slightly greater angle than that of the shoring panels creating a spring effect assisting the tabs into the material of the shoring panels thus holding the panels together.

20. The method of claim 16, wherein the step of connecting the corners of the adjacent shoring panels comprises

cutting of "J" channel of a metal or other material on one vertical plane and one horizontal plane, leaving the remaining vertical plane intact, bending at this point to any angle, and placing over and or under the horizontal edges of said shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

21. The method of claim 1, wherein a plurality of shoring panels are positioned adjacent to each other to surround one or more earthen pads.

22. The method of claim 21 further comprising the step of:

encircling the adjacent shoring panels with adhesive fabric tape, metal banding, or plastic tape or banding to prevent the corners from separating while retaining the loose fill of the earthen pad.

23. The method of claim 1 further comprising the step of:

placing a temporary or permanent spacer between the earthen side of a pad and the vertical face of a shoring panel adjacent another earthen pad.

24. The method of claim 23, wherein said spacer comprises foam, wood, plastic blocks, bricks, or wire cages.

25. The method of claim 1 further comprising the step of:

placing a temporary or permanent spacer between the vertical face of a shoring panel adjacent one earthen pad and the vertical face of a shoring panel adjacent another earthen pad.

26. The method of claim 25, wherein said spacer comprises foam, wood, plastic blocks, bricks, or wire cages.

27. The method of claim 1 further comprising the step of:

dragging a screed across the top portion of the shoring panels to smooth the backfilled sand over the earthen pads.

28. A method for improving the shape of the underside of ribbed concrete slab-on-ground foundations comprising the steps of:

digging trenches in the ground to form one or more earthen pads with ribs, wherein said trenches are dug by hand or by a trenching machine;

positioning one or more shoring panels adjacent to at least one of said earthen pads along at least part of one vertical side of a rib, wherein said shoring panels are made from expanded polystyrene treated with a termiticide;

shaping said shoring panels to form an efficient cross-sectional profile or shape that will mold the concrete into various shapes;

connecting the corners of the adjacent shoring panels;

supporting said shoring panels adjacent said earthen pads with a stake driven into the ground, wherein said stake comprises steel re-bar, wood, sheet metal, composite material, or plastic or rigid pipe;

backfilling sand in the void between said shoring panels and earthen pad, wherein said backfilled sand comprises fine sand, trenching spoils, or loose fill;

dragging a screed across the top portion of the shoring panels to smooth the backfilled sand over the earthen pads;

adding a vapor barrier over said earthen pads, backfilled sand, and shoring panels;

providing an outer perimeter form around the exterior of the earthen pads; and

pouring concrete within the perimeter defined by the outer forms and over said earthen pads, backfilled sand, shoring panels, vapor barrier, and trenched ribs.

29. An apparatus for improving the shape of the underside of ribbed concrete slab-on-ground foundations, the foundation having earthen pads and trenched ribs, comprising:

one or more shoring panels placed adjacent to said pad along at least part of one vertical side of a rib.

30. The apparatus of claim 29, wherein said shoring panels are made from any rigid material capable of maintaining its stiffness long enough for the installation process, inspection, placement of concrete, and the initial curing or set of the concrete.

31. The apparatus of claim 29, wherein said shoring panels are made from a lightweight rigid foam.

32. The apparatus of claim 29, wherein said shoring panels are made from a high density foamed synthetic resin such as expanded polystyrene, extruded polystyrene foam, polyurethane foam, or a foamed phenolformadehyde or like resin.

33. The apparatus of claim 29, wherein said shoring panels are made from expanded polystyrene treated with a termiticide.

34. The apparatus of claim 29 further comprising:

sand backfilled in the void between said shoring panels and earthen pads.

35. The apparatus of claim 29 further comprising:

a stake driven into the ground to support said shoring panels.

36. The apparatus of claim 29, wherein said shoring panels are shaped to form an efficient cross-sectional profile or shape that will mold the concrete into various shapes.

37. The apparatus of claim 36, wherein said profile or shape comprises a "C" shape, "L" shape, "I" shape, "I" shape, "F" shape, convex shape, or concave shape.

38. The apparatus of claim 29 further comprising:

means for connecting the corners of the adjacent shoring panels.

39. The apparatus of claim 38 wherein said means for connecting the corners of the adjacent shoring panels comprises

a band of adhesive fabric tape, metal banding, or plastic tape or banding applied to the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

40. The apparatus of claim 38 wherein said means for connecting the corners of the adjacent shoring panels comprises

a metal strap, windstorm strap, or other material strap applied to the shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

41. The apparatus of claim 38 wherein said means for connecting the corners of the adjacent shoring panels comprises

a metal or other material "J" channel cut on one vertical plane and one horizontal plane, leaving the remaining vertical plane intact, bending at this point to any angle, and placing over and or under the horizontal edges of said shoring panels to prevent the corners from separating while retaining the loose fill of the earthen pad.

42. The apparatus of claim 29 further comprising:

a temporary or permanent spacer placed between the earthen side of a pad and the vertical face of a shoring panel adjacent another earthen pad.

43. An apparatus for improving the shape of the underside of ribbed concrete slab-on-ground foundations comprising:

a trenching machine for digging trenches in the ground to form one or more earthen pads with ribs;

one or more shoring panels positioned adjacent to at least one of said earthen pads along at least part of one vertical side of a rib, wherein said shoring panels are made from expanded polystyrene treated with a termiticide and are shaped to form an efficient cross-sectional profile or shape that will mold the concrete into various shapes;

means for connecting the corners of the adjacent shoring panels;

a stake driven into the ground to support said shoring panels adjacent said earthen pads, wherein said stake comprises steel re-bar, wood, sheet metal, composite material, or plastic or rigid pipe;

means for backfilling sand in the void between said shoring panels and earthen pad, wherein said backfilled sand comprises fine sand, trenching spoils, or loose fill;

a screed dragged across the top portion of the shoring panels to smooth the backfilled sand over the earthen pads;

a vapor barrier draped over said earthen pads, backfilled sand, and shoring panels;

an outer perimeter form provided around the exterior of the earthen pads; and

concrete poured within the perimeter defined by the outer forms and over said earthen pads, backfilled sand, shoring panels, vapor barrier, and trenched ribs.

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