1. The type of soil is a factor in determining foundation construction details such as footing design, backfill, and drainage provisions. Soils are classified by their composition and how they drain. Soil classifications for most areas are listed in the standard series of soil surveys published by the U.S. Department of Agriculture’s Soil Conservation Service. Extreme’s Foundation panels may be built in Group I, II, or III soils. In poorly drained Group III soils, granular fill under slab for basement type foundations must be 6” deep instead of the 4” minimum for Group I and II soils. Group IV soils are generally not recommended for Extreme’s Foundation panels, unless special measures are taken. For building sites in areas where expansive clay soils in Group II, III, or IV occur, a licensed soils engineer should be consulted to determine modifications required for foundation footings, drainage, soil moisture control, and back fill around the foundation. In such cases, special design considerations and construction details may be needed to avoid soil expansion or shrinkage which might otherwise affect foundation and floor performance. For basement type foundations, a sump, draining to daylight or into a storm sewer is recommended for all soil types. (Refer to attached “Table 1-Types of soils and related design properties” from Southern Pine Council PWF Design & Construction Guide. www.southernpine.com).

2. Granular materials are recommended for footings under Extreme’s Foundation panels, but continuous poured concrete may also be used for footings. Granular materials are to be used for fill under the basement slab and a portion of the backfill to provide an optimum drainage system. The granular material may be crushed stone, gravel or sand, and must be clean and free of silt, clay, and organic material. Limitations are:
   - Maximum of 1/2” for crushed stone
   - Maximum of 3/4” for gravel
   - Minimum of 1/16” for sand

3. Footings need to be placed on undisturbed soil and the footing excavation should extend below the frost line. To achieve proper frost protection for low backfill heights like where egress windows are located, either the footing needs to be excavated to the proper depth or a layer of 3 1/2” expanded polystyrene foam or 2” extruded polystyrene foam (min. r-value requirement of 10.5). Insulation is to be placed horizontal at a height of 10” from the bottom of the footing to allow proper drainage. It is to be a strip a minimum of 24” wide and extend a minimum of 24” past on both sides of the opening.
4. For concrete footings, typically minimum size of 8” thick by 16” wide and a minimum compressive strength of 2500 lbs., it is recommended to place the footing on 4” of granular material to maintain continuity of the drainage system, otherwise 3” drains at 6’ o.c. must be provided through the concrete footings. In Group I and II soils, place a minimum of 4” of granular fill and for Group III soils use a minimum of 6” of granular fill under the slab, for proper drainage to a Sump pit located in the interior or exterior of the foundation. With Group I soils, granular material can be used for drainage on the outside of the foundation as long as it is covered by a 6 mil poly sheeting or water permeable filter fabric to prevent soil from washing into the footing. In Group II and III soils it is recommended that a 4” perforated tile be placed at same grade level as the footing and covered with a filter cloth to keep the perforations open. This tile along with the granular bed under the slab needs to be sloped toward the sump to drain properly. Alternative drainage systems like Form-A-Drain can be used for both the concrete forms and the drainage system for the concrete footings. An automatic electric sump pump will be needed if the sump cannot be drained by gravity to daylight or to a storm sewer system.

5. Anchor the .60 CCA treated 2x8 to the concrete footing using 1/2” x 8” galvanized anchor bolts 4’ o.c. and located within 12” from the end of each plate section. Remember to set the plates in 5/8” from outer dimensions of the structure to allow for exterior skin of panel to fit on the outside of the plate.

6. Install Extreme’s Foundation panel according to the panel layout drawing provided. Use Panel Adhesive/Sealant for all wood to wood connections. Use the expandable foam with gun for all wood to foam or foam to foam connections. Refer to page 18 of Extreme Panel’s Construction Detail Manual for placement of these products. Nail all panel connections using 2” stainless steel (type 304 or 316) ring shank nails 8” o.c.. These materials are supplied by Extreme Panels. Any other alternative products need to be approved by Extreme Panels. Note: If a pneumatic nailer is used, do not drive the heads of the nails in any deeper than 1/8”. Top plates (typically not treated) are to be installed with the ends of the top plates staggered to not fall on the seam of a panel vertical connection.

7. Seal exterior joints in the plywood using 4” SIP Flashing which is supplied by Extreme Panels. The Panel Adhesive/Sealant can also be used.
8. Floor systems: **OPTION 1:** For a maximum backfill height of 9'-4”, floor systems need to be hung on the inside of Extreme’s Foundation panels using top mount joist hangers designed for the floor system being used. The 3/4” decking is to be extended over the top plate of the panels to the outside edge of the structure. For bracing the foundations walls that are running parallel to the floor joists, place the metal bracket supplied by Extreme Panels centered on each vertical Glu-lam with a maximum of 4'-0” o.c. with the bottom of the bracket lined up with the bottom of the floor joist. Fasten this bracket with (4) 5/16” x 3” RSS lag screws. Place a 2x4 at an angle between 30 & 45 degrees up to the top chord of at least the second floor joist. Use a framing angle clip (USP# MP3 using (6) 10d x 1 1/2” nails) either on the top side or the bottom side to secure the connection. Refer to the attached diagram for placement. This will be able to distribute 1000 lbs. of load to the diaphragm of the 3/4” decking material that is to be fastened to the joist & top plate using #9 x 1 1/2” screws or 8d common nails spaced 6” o.c. edges & 12” o.c. on intermediate supports and glued using sub-floor adhesive. Any strong-back bracing that the floor joist manufacturer requires will need to be installed also, typically this is a vertical 2x6 placed 10’ o.c.. Refer to panel layout to place solid blocking required through floor system for point loads from structure above.

**OPTION 2:** For a maximum backfill height of 8”-4” and higher finished ceiling height, floor systems can be stacked on top of the Extreme Foundation panels. Extreme’s Insulated Rimboard must be used with the sill plate being attached to the top plate of the panels using sub-floor adhesive and #9x3” screws or 16d nails 6” o.c. staggered. Refer to page 33 of Extreme Panel’s Construction Detail Manual for installation guidelines for the rimboard itself. Set the floor system that has been designed for the structure according to their layout. Fasten the floor joists to the top plate of the panel using (3) #9x3” screws or (3) 16d nails. Two angle clips (USP # MPA1) are required for each end of the joist where it is bearing on exterior walls to secure joist to top plate with (12) 8d x 1 1/2” nails for each clip. For bracing the foundation walls that are running parallel to the floor joists, place the metal bracket supplied by Extreme Panels every 4'-0” o.c. fastened to the top plate on the inside of the rimboard using (3) 5/16” x 3” RSS lag screw. Place a 2x4 at an angle between 30 & 45 degrees up to the top chord of at least the second floor joist. Use a framing angle clip (USP# MP3 using (6) 10d x 1 1/2” nails) either on the top side or the bottom side to secure the connection. Refer to the attached diagram for placement. This will be able to distribute 1000 lbs. of load to the diaphragm of the 3/4” decking material that is to be fastened to the joist & rimboard using #9 x 1 1/2” screws or 8d common nails spaced 6” o.c. edges & 12” o.c. on intermediate supports and glued using sub-floor adhesive. Any strong-back bracing that the floor joist manufacturer requires will need to be installed also, typically this is a vertical 2x6 placed 10’ o.c.. Refer to panel layout to place solid blocking required through floor system for point loads from structure above.

**Interior supports** for floor framing may be posts and girder beams or unsheathed .60 CCA treated 2x6 lumber (untreated if built above concrete) built wall. For lumber built wall, align studs w/ joist or use double top plates. Wall can be placed on concrete footing designed the same as exterior foundation or placed on a granular footing with a 2x10 .60 CCA treated base plate and .60 CCA treated sill plate. For high concentration loads, footing size may have to be increased.
9. Concrete floor installation: Concrete floor is to be poured a minimum of 3 1/2” thick, a minimum compressive strength of 2500 lbs., and 2” up on the panel from the bottom of the plywood. A 1x screed board is optional along base of panel.

10. Below grade moisture barrier: 6 mil poly is to be applied over the below grade portion of the foundation. A single layer is adequate, but 2 layers is suggested for extra protection when backfilling. Poly is to be draped over the footing, but is not to extend over the drainage tile. Joints in the poly are to be lapped a minimum of 6” and sealed with Panel Adhesive/Sealant or equivalent. The top edge of the poly is to be bonded to the panel to create a seal. This is to be achieved by using at least a 12” treated plywood strip or other strips can be used for architectural treatment. Before strip is installed, a continuous seal of adhesive is to be applied between the wall and strip. The strip needs to extend at least 9” below grade.

11. Backfilling: Backfilling is not permitted until basement floor and first floor have been constructed. A maximum backfill height depends on the floor system design used from #8 of this document. If the floor is hung on the inside of the panel, then 9’-4” is permitted. If the floor system is stacked on top of the panel, then 8’-4” is permitted. Granular material is to be used for backfill. Backfill a distance of 2’-0” out from the wall and 2/3 the height of the total backfill height. Granular material is then to be covered with either 30 pound asphalt paper or 6 mil poly to allow for water seepage while avoiding infiltration of fine soils. The remaining of the backfill can use the same type of soil as was removed during the excavation. Finish grade is to slope a 1/2” per foot a minimum of 6’-0” from structure.

12. Interior surface of panels may need to be covered with a fire retardant with the equivalent of 1/2” sheetrock if it is going to be used for living space.
STACKED FLOOR SYSTEM:
The design of stacking the floor system on top of the
10' high extreme foundation panels is only permitted with
the maximum backfill height of 7'-0".

M4 - SIDE VIEW
M4 - FRONT VIEW

FLOOR TRUSS
R/M BOARD
M4 ANGLE
- SEE DETAIL
FOUNTION PANEL

TOP VIEW
SIDE VIEW

MPA - FRONT VIEW
MPA - SIDE VIEW

DOUBLE TOP PLATE
HEADER VARIES SEE PANEL LAYOUT
EGRESS WINDOW

EXTREMES FDN BRACKET, SEE DETAIL

CONCRETE DRAIN ALTERNATE

(3) 3/8" RS5 LAG SCREWS
(2) 3" SCREWS OR 1 1/2" NAILS
MP3 CLIP
1/8" STEEL MATERIAL

EPS FOAM

1'-0" GRANULAR FILL

M4 - MINIMUM EGRESS HEIGHT

DETAIL TITLE: OPTIONAL FLOOR MOUNT & DRAINAGE
FOOTING TYPE: CONCRETE FOOTING ALTERNATIVES
UPDATED: 05/10/06
<table>
<thead>
<tr>
<th>Soil Group</th>
<th>Unified Soil Classification</th>
<th>Soil Description</th>
<th>Allowable Bearing (in Pounds Per Square Foot) with Medium Compaction or Stiffness</th>
<th>Drainage Characteristics</th>
<th>Final Retention Potential</th>
<th>Volume Change Potential Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Envelope</td>
<td>GS</td>
<td>Well-graded gravel, gravel-sand mixtures, little or no fines</td>
<td>8000</td>
<td>Good</td>
<td>Low</td>
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<tr>
<td></td>
<td></td>
<td>GP</td>
<td>Poorly-graded gravel or gravel-sand mixtures, some or no fines</td>
<td>6000</td>
<td>Good</td>
<td>Low</td>
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<td></td>
<td>SW</td>
<td>Well-graded sands, gravely sands, little or no fines</td>
<td>6000</td>
<td>Good</td>
<td>Low</td>
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<tr>
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<td></td>
<td>SP</td>
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<td></td>
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<td>4000</td>
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<td>Medium</td>
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<td></td>
<td></td>
<td>SM</td>
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<td>Medium</td>
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<td></td>
<td></td>
<td>SC</td>
<td>Clayey sands, sand-clay mixtures</td>
<td>4000</td>
<td>Medium</td>
<td>Medium</td>
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<td></td>
<td></td>
<td>ML</td>
<td>Inorganic silts and very fine sands, rock flour, silty or clayey fine-sands or clayey silty clay with slight plasticity</td>
<td>2000</td>
<td>Medium</td>
<td>High</td>
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<tr>
<td></td>
<td></td>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clay</td>
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<td>Medium</td>
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<tr>
<td>Group III</td>
<td>Poor</td>
<td>CH</td>
<td>Inorganic clays of high plasticity, fat clays</td>
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<td>Poor</td>
<td>Medium</td>
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<td></td>
<td></td>
<td>MH</td>
<td>Inorganic silts, micaceous or diotomite fine sands or silt clays, silty clays</td>
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<td>High</td>
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<td>Organic silts and organic silt clays of low plasticity</td>
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</tr>
<tr>
<td></td>
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<td>Organic clays of medium to high plasticity, organic soils</td>
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<td>Unsatisfactory</td>
<td>Medium</td>
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<td></td>
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<td>PI</td>
<td>Poor and nearly highly organic soils</td>
<td>-</td>
<td>Unsatisfactory</td>
<td>Medium</td>
</tr>
</tbody>
</table>

1. Allowable bearing values may be increased 25 percent for very coarse-grained gravelly or sandy soils or very fine-grained clay or silt soils. Inorganic silts and very fine sands, rock flour, silty or clayey fine-sands or clayey silty clay with slight plasticity may be increased 25 percent for fine-sand grading or sandy soils. Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clay may be increased 25 percent for clays grading or sandy soils. Inorganic clays of high plasticity may be increased 25 percent for clay soils. Organic clays of medium to high plasticity, organic soils may be increased 25 percent for organic soils.

2. The permeability test for good drainage is to force 18 inches per hour, medium drainage is 2 to 8 inches per hour, and poor is less than 2 inches per hour.

3. For expansive soils, a total soil engineer for consideration of design recommendations.

4. Unsatisfactory expansion index of these soil types are not subject to future swelling.