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. 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 crawl space 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 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, either the footing needs to be excavated to the proper depth or refer to section R403.3 of the IRC code book or refer to the “Revised Builder’s Guide to Frost Protected Shallow Foundations”. This can be determined for site specific situations.
4. For granular footings which are typically minimum of 10” deep by 24” wide, a .60 CCA treated 2x12 is used for the base plate. This base plate must be placed on uniform well compacted granular footings and staked into position every 4’-0”. 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 in the crawl space area needs to be sloped toward the sump to drain properly. 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. Attach the .60 CCA treated 2x8 to the 2x12 base plate using 10d stainless steel (type 304 or 316) nails 8” o.c. staggered, or a 3” RSS stainless steel lag screw 12” o.c. staggered. Multi-purpose sub-floor adhesive is to be used between the two plates. Make sure that ends of sill plate are at a minimum distance of 2’-0” from the ends of the base plate. 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. Backfill height for the inside of the foundation needs to be a maximum difference of 32” from exterior backfill height. This means that if the maximum exterior backfill height of 3’-4” will need an inside backfill height of 8” with the minimum being 6”.

9. Floor systems can either be stacked on top of the foundation or can be set to the inside of the foundation. There is to be a minimum clearance in the crawl space area of 18” to the floor system and 12” to any supporting member for the floor. For stacking the floor and you are using Extreme’s Insulated Rimboard, refer to page 33 of Extreme Panel’s Construction Detail Manuel for installation guidelines. If an alternative rimboard is used, follow that products installation manual. 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. If you are setting the floor on the inside of the foundation, the top of the joists are even with the top plate of foundation. The joists are supported by either framing hangers or on a ledger built on the inside of the foundation. Floor decking is to run over the top of the foundation to the outside edge of the panel. For joists that are running parallel to the foundation walls a continuous run of 2x6’s at 10’ o.c. the entire length of the structure. These are to be fastened to blocking placed on the
rimboard and the top plate of the panel using #9x3” screws. Refer to page 39 of Extreme Panel’s Construction Detail Manual for placement of bracing. Also refer to the manufacturer guidelines of the floor joist. Bracing required by the manufacturer can be incorporated with bracing required for the foundation walls. (It does not matter where on the panel seams these are located). 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 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. For high concentration loads, footing size may have to be increased.

10. Below grade moisture barrier: 6 mil poly is to be applied over the below grade exterior portion of the foundation and over the granular material on the inside area of the crawl space. A single layer is adequate, but 2 layers is suggested for extra protection on the exterior 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 floor system has been constructed. A maximum backfill height of 3’-4” and a minimum backfill height of 12” is permitted. Granular material is to be used for backfill. Backfill a distance of 1’-4” 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. Air quality in the crawl space area needs to be addressed. This can be achieved by circulating the air using a mechanical ventilation system. Ventilation can be incorporated with the air exchange system or heating system. This would need to be provided at the rate of 1.0 cfm for each 50 square feet of underfloor space and ground surface is covered with 6 mil poly.
 PANEL ASSEMBLY:
* ⅝" TREATED PLYWOOD
* 7¾" EPS FOAM
* ⅝" TREATED PLYWOOD

5-PLY 2x4 .GO TREATED
GLU-LAM SPLINE, 4'-0" O.C.

DETAIL TITLE: BELOW GRADE 8' CRAWL SPACE PANEL
FOOTING TYPE: GRANULAR FOOTING
UPDATED: 05/18/05
DETAIL TITLE: ALTERNATE TOP PLATES
FOOTING TYPE: GRANULAR FOOTING ALTERNATES
UPDATED: 05/05
<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 Mixture Compaion or Stiffness</th>
<th>Drainage Characteristics</th>
<th>Frost resistance Potential</th>
<th>Volume Change Potential Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I: Excellent</td>
<td>OS</td>
<td>Well graded gravels, gravel-sand mixtures, little or no fines</td>
<td>8000</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
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<tr>
<td></td>
<td>GP</td>
<td>Poorly graded gravels or gravel-sand mixtures, peat or no fines</td>
<td>8000</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>OW</td>
<td>Well graded sands, gravelly sands, little or no fines</td>
<td>6000</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>WP</td>
<td>Poorly graded sands or gravelly sands, little or no fines</td>
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<td>Good</td>
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<tr>
<td></td>
<td>SM</td>
<td>Silty gravels, or well-sand-silt mixtures</td>
<td>4000</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>SM</td>
<td>Silty sands, sand-silt mixtures</td>
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<td>Medium</td>
<td>Low</td>
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<tr>
<td>Group II: Fair to Good</td>
<td>GC</td>
<td>Clayey gravels, gravel-sand-clay mixtures</td>
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<td>Medium</td>
<td>Low</td>
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<tr>
<td></td>
<td>SC</td>
<td>Clayey sands, sand-clay mixtures</td>
<td>4000</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
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<tr>
<td></td>
<td>NL</td>
<td>Inorganic clays and very fine sands, rock flour, silty or clayey fine sands or clayey silty with slight plasticity</td>
<td>2000</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
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<tr>
<td></td>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays</td>
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<td>Medium</td>
</tr>
<tr>
<td>Group III: Poor</td>
<td>CH</td>
<td>Inorganic clays of high plasticity, fat clay</td>
<td>2000</td>
<td>Poor</td>
<td>Medium</td>
<td>High</td>
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<tr>
<td></td>
<td>ML</td>
<td>Inorganic clays, montmorillonitic fine sands, or sandy clays, silty clays</td>
<td>2000</td>
<td>Poor</td>
<td>High</td>
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<td>Group IV: Very Poor</td>
<td>OL</td>
<td>Organic clays and organic-clayey clays of low plasticity</td>
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<td>Medium</td>
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<tr>
<td></td>
<td>OH</td>
<td>Organic clays of medium to high plasticity, organic clays</td>
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<td>PI</td>
<td>Poor and/or very highly organic soils</td>
<td>4000</td>
<td>Poor</td>
<td>Medium</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 clays or silty soils.
2. The permeability test for good drainage is over 10 inches per hour, medium drainage is 2 to 10 inches per hour, and poor is less than 2 inches per hour.
3. For expansive soils, a soil stability engineer should evaluate the design conditions.
4. Dangers of most soils may occur if those soils are dry or subject to freezing conditions.