TECHNICAL OPERATIONS MANUAL (TOM) for COMPOSITE CRIBBING

“Lift an inch, crib an inch”

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PREPARED BY TURTLE PLASTICS
“WORKING LOAD” also known as “design load” or “safe load”, is generally a fraction of the “ultimate strength.” “Ultimate strength” refers to the force required to cause complete failure of a supporting structure. “Design load” determines the size and number of box cribs required. “Design load” should be no more than 1/3rd of “ultimate strength.”

“BOX CRIB” is so named because of the box that is formed when the pieces are set. The crib MUST be on a flat, level surface and top tier of the crib should be solid; that is, with several pieces laid side by side so that there are no openings, or topped with a solid plate that distributes the weight down to the contact points.

WOOD has historically been used to crib. Due to variations in the quality of ANY GRADE AND SPECIES OF WOOD, it is impossible to predict the load capacity for any individual box crib. Although Douglas fir may be recommended, strength will be unknown due to unseen knots, cracks, rot, or dryness.

COMPOSITE CRIBBING, although more uniform and not subject to rot, load capacity is difficult to predict. However, lateral stability will be significantly improved over wood because of the interlocking “Lincoln log” and pyramid configurations. There is, of course, much more consistency in the formulation of the resin and strict production controls regarding temperature, back pressure control, and cooling procedures.

SOME GUIDANCE is provided by the attached excerpt from the U.S. Army Corps of Engineers Urban Search and Rescue Program—“Shoring Operations Guide.” That guide suggests that a two-member, 4˝ by 4˝ box crib can support 24,000 lbs. or 6,000 lbs. at each contact point (THIS IS WHY IT IS VITALLY IMPORTANT THAT THE TOP TIER DISTRIBUTE THE LOAD EVENLY). That same 4˝ by 4˝ crib, in a three-member crib, could support about twice that, or 48,000 lbs. A 6˝ by 6˝ will support a 60,000 lb. load using a two-member crib, and twice that using a three-member crib.

THE USER MUST BE FAMILIAR WITH THIS GUIDE AND ONLY THE END USER CAN DETERMINE LOAD CAPACITY. ANY BENDING, DEFLECTION, SAGGING, BULGING, OR DEFORMITY WILL NECESSITATE ADDITIONAL CRIBS.

AS THE USE OF OUR PRODUCTS UNDER USER’S CONDITIONS ARE BEYOND OUR CONTROL, NO WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, IS MADE CONCERNING OUR PRODUCTS.

DISCLAIMER: UNDER NO CIRCUMSTANCES SHALL COMPANY BE LIABLE TO THE ORIGINAL PURCHASER AT RETAIL OR ANY OTHER PERSON FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER ARISING OUT OF BREACH OF WARRANTY, BREACH OF CONTRACT, OR OTHERWISE. COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY BREACH OF WARRANTY IN AN AMOUNT EXCEEDING THE PURCHASE PRICE OF ANY PRODUCT, NOR WILL COMPANY BE BOUND BY ANY STATEMENT OR REPRESENTATION AS TO THE QUALITY OR PERFORMANCE OF ANY PRODUCT.

FURTHER INFORMATION: Should you require further information, please call us at extention 202. Also should you wish to arrange for a visit by an individual trained in cribbing issues, please call us.
Cribbing Specs

66-SC-36 Black Composite Plastic Crib

Size: 6” X 6” X 36”
Material: HDPE (High Density Polyethylene Recycled)
Safety Data Sheet: Attached (for HDPE)
Lab Tests for Strength: Attached (same as 67SC-24)

6/7-24 Composite Plastic Wedge

Size: 6” X 6” X 24”
Material: HDPE (High Density Polyethylene Recycled)
Safety Data Sheet: Attached (for HDPE)
Lab Tests for Strength: Attached (same as 67SC-24)

EXAMPLES OF A TYPICAL COMPOSITE CRIB AND WEDGE
For a more complete list of products, email jennifer@turtleplastics.com
DESIGN STRENGTH is BASED on CROSSGRAIN BEARING
(VARIES FROM 200 PSI TO 1000 PSI DEPENDING ON WOOD SPECIES
500 PSI IS USED HERE - EXAMPLE 500 x 3.5 x 3.5 x 4 = 24,000)
FOR 2 MEMBER x 2 MEMBER LAYOUT
4 x 4 CRIB CAPACITY = 24,000 LBS (12 TONS)
6 x 6 CRIB CAPACITY = 60,000 LBS (30 TONS)

FOR 3 MEMBER x 3 MEMBER CRIB, CAPACITY IS 9/4 AS MUCH
500 x 3.5" x 3.5" x 9 = 55,000, 500 x 5.5" x 5.5" x 9 = 136,000

BOTTOM LAYER SHOULD BE SOLID TO SPREAD THE LOAD
ESPECIALLY ON SOIL OR ASPHALT PAVING
LIMIT HEIGHT TO 3 TIMES WIDTH (SHORTEST WIDTH FOR NON-SQUARE CRIBS)
OVERLAP CORNERS BY 4 INCHES TO ASSURE SLOW CRUSH TYPE FAILURE

4" x 4" CRIBBING WITH FOUR BEARINGS

MOST STABLE METHOD
(HEIGHT TO WIDTH MAY BE 3 TO 1 MAX.)

KEEP HEIGHT TO WIDTH WITHIN 1 1/2 TO 1

6,000 LB. EACH CONTACT

6,000 LB. EACH CONTACT

KEEP HEIGHT TO WIDTH WITHIN 1 TO 1
Chemical Resistance Polyethylene - PE
Chemical resistance of polyethylene

**Polyethylene is a very popular material. It is:**
- easy and light weighted
- long living
- low friction
- relatively cheap
- flexible
- sun resistant

And resistant to chemicals. Chemical resistance to some common chemicals.

**Polyethylene and Very Good Chemical Resistance**
- Acetonic acid
- Ammonium hydroxide 30%
- Calcium hydroxide 30%
- Diethylene glycol
- Ethylene glycol
- Ethanol 100%
- Glycerin
- Glycol
- Hydrogen peroxide 30%
- Mercury
- Methanol
- Potassium hydroxide 30%
- Sodium hydroxide 30%

**Polyethylene and Good Chemical Resistance**
- Acetone
- Formaldehyde 10–40%
- Gas oil
- Caproic acid
- Iodine
- Isobutanol
- Isopropanol
- Mercal oil
- Motor oil
- Natural gas
- Gasoline
- Phenol
- Transformer oil
- Vaseline

**Polyethylene and Medium Chemical Resistance**
- Dibutylether
- Ethylene acetate 100%
- Furfurol 100%
- Heptane
- Paraffin

**Polyethylene and Poor Chemical Resistance**
- Diethylether
- Ethylenechloride
- Hydrogen peroxide 90%
- Methylene chloride

**Polyethylene and None Chemical Resistance**
- Acetylene dechloride

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**Miscellaneous Information**

**US&R Shoring Operations Glossary of Terms**

**Column** – A vertical structural member subject to compressive forces.

**Compression** – A force which tends to push the mass of a material together.

**Concentrated Load** – A load applied at one point or within a limited area of a structure.

**Plastic Crib Facts**
- Multiple sizes, shapes fit most applications
- Interlocking or aggressive non-slip surface
- Non-conducting plastic resists oil and most chemicals*
- Does not splinter like wood
- Carrying lanyards provided on all 6” x 7” crib blocks and on yellow 4” x 4” crib blocks
- Made from 100% recycled plastics

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*Polyethylene and Medium Chemical Resistance*
Plastic cribbing blocks are designed to safely support and stabilize lifted loads.

2) PLASTIC CRIBBING SAFETY PRECAUTIONS

WARNING: Failure to observe the following safety precautions and instructions may result in serious personal injury or death.

- Cribbing must be constructed in accordance with standards and recommendations provided by U.S. government agencies such as FEMA, OSHA and the Army Corps of Engineers (or the applicable regulatory agencies in your country and/or municipality).
- Cribbing must be constructed only by trained and experienced personnel under the direction of a qualified technician or engineer trained in cribbing applications and safety.
- Do not use cribbing which is cracked, split, warped or obviously damaged. Never use chemically damaged cribbing.
- Do not allow personnel to climb or hang onto cribbing. Never use cribbing lanyards (straps) as grab handles or as a means of support. Cribbing could shift or fall.
- Never exceed the maximum capacity of the cribbing.
- Whenever possible, avoid intermixing wood, metal or other forms of cribbing with plastic cribbing.
- Be certain that the ground, floor or other surface is capable of supporting the combined weight of the crib structure and the load to be supported. Never build cribbing on loose or unstable ground.

3) INTRODUCTION

Cribbing is available in several different types and forms:

- **Metal cribbing** may consist of devices such as jack stands, locking hydraulic cylinders or screw extension devices.
- **Wooden cribbing** is the most common type of cribbing. It is available as softwood (southern yellow pine or Douglas-fir) and hardwood (oak or red maple).
- **Softwoods** are typically used where lighter cribbing weight is desired. Softwoods often audibly and visibly crack just prior to catastrophic structural failure. Softwoods also readily absorb water, oil and other fluids.
- **Hardwoods** are typically used where heavier loads are experienced. They do not visibly or audibly crack prior to structural failure and are less absorbent than softwoods.
- **Plastic cribbing** is used when maximum crib stability and material durability are desired. Plastic cribbing deforms slowly under loads and usually does not fail catastrophically. Plastic cribbing also does not absorb most common fluids. However, it is important to reference chemical compatibility sources for the type of plastic that the cribbing blocks are manufactured from (typically HDPE) and its reaction to the fluid in question.

For wooden and plastic cribbing, individual pieces of cribbing are typically referred to as “cribbing blocks” and the structures or stacks are commonly described as “cribs.”

Important: Whenever possible, avoid intermixing cribbing blocks. Due to differences in material compression and coefficient of friction, extreme care must be exercised when intermixing wooden or metal cribbing with plastic cribbing.

4) CRIB BUILDING GUIDELINES

5.1 Crib Construction Types

When properly built, cribs transfer the load perpendicular to the cribbing blocks, resulting in an even compression of the crib. Crib structures can compress as much as 10 to 20 percent under load. For this reason, it may be necessary to “overbuild” the crib structure(s) taller to allow for the compression that will occur under heavy load conditions.

Box cribs are commonly constructed using either a “2-point” or “3-point” crisscross of cribbing blocks positioned at 90-degree angles. An arrangement may be square or rectangular. Whenever possible, cribs should be built in square or rectangular shapes to maximize load capacity, stability and safety.

Parallel cribs are similar to box cribs except that the crisscrossed cribbing blocks are not placed at a 90-degree angle. This configuration is inherently less stable than a box crib and is typically used only when space limitations do not allow room for a box crib.

Triangle cribs can be used when there is not enough room for a box or parallel crib. This method provides the least stability, but may be the only solution if space is especially limited.

5.2 Height-to-Width Ratios

As a general rule, the box crib stack height should not exceed 2.5 times the length of the cribbing blocks used to build the crib stack.

Important: Height-to-width ratios for parallel and triangle cribs should be kept close to a 1:1 ratio, because the geometries provide less stable support than box cribs.

5.3 Support Capacity

Never exceed the maximum load rating for the cribbing blocks or cribs.

If a load to be supported exceeds the maximum capacity of one crib structure, additional crib structures must be built to support the object. Limiting factors for crib structures include:

1) The available area under the load to construct a properly built crib.
2) Surface stability of the ground or floor under the crib.

When using more than one crib to support an object, be sure that the weight of the object is evenly distributed across all cribs.

WARNING: Do not exceed maximum load ratings for cribbing. If the crib is loaded to the point that the cribbing blocks are fracturing, splitting or cracking, the maximum load rating has been exceeded and a dangerous situation is present. As required, build an additional crib or cribs to support the load.

Crib structures can compress as much as 10 to 20 percent under load. For this reason, it may be necessary to “overbuild” the crib structure(s) taller to allow for the compression that will occur under heavy load conditions.

Important: Loaded crib structures should be inspected at least once a day to assure continued tightness and stability.
Excessive heat can cause the plastic cribbing material to creep, resulting in diminished load carrying capacity. Extreme cold can cause the cribbing material to fracture prematurely.

5.4 Crib Building - General Instructions

Plastic cribbing blocks contain both interlocking and pyramidal surfaces. This allows two distinct methods for building crib stacks:

1) Interlocking surface - Mechanically interlocking the cribbing blocks in pre-cast notches (all except 2” x 4” x 18” size) helps ensure maximum structural integrity. Using the "box crib" method, cribbing blocks are stacked at 90-degree angles.

2) Pyramid surface - When constructing parallel and triangle cribs, a combination of gravity and surface friction maintains the structure. Using this method, cribbing blocks may be stacked at angles other than 90 degrees.

On the 4” x 4” x 18” and 6” x 7” x 24” sizes, the blocks can be arranged using either the pyramidal (pyramid textured) or interlocking (notched) sides as the weight-bearing surface. When building a crib that does not have a rectangular shape, the pyramidal surface must be used as the weight-bearing surface.

When using the pyramidal surface, ensure that there is sufficient overlap at the crib corners. Corners of the crib should overlap by the longest dimension of the crib face that is being loaded. This will assure the desired failure mode (characteristics) in the event that the crib is overloaded.

WARNING: Be certain that the crib structure will be capable of holding the total weight of the object being supported. Build additional crib structures if required to adequately support the total weight of the object.

WARNING: Do not build a non-rectangular crib that is more than 20 degrees out-of-square. Without a mechanical stop, friction and gravity will not hold the crib together.

All cribs must be positioned on a flat and stable surface. When necessary, wedges must be used to help stabilize and level the crib so that when loaded, the top surface is level.

Lift the object to be cribbed in a safe manner, using appropriate lifting devices. Whenever possible, build the crib to the desired height and then lift the object in place on top of the crib. If this is not possible, use the stage lifting method ("lift an inch, crib an inch") to build the crib.

WARNING: Never work under an object that is not supported by a sufficiently robust crib structure.

5.5 Shoring (Supporting a Sloped Load)

Whenever possible, the load should be positioned perpendicular to the top surface of the crib. However, if the load must remain sloped, build the cribbing into the load using thinner cribbing blocks and/or wedges.

Always observe the following requirements when shoring sloped loads using plastic cribbing blocks:

1) The load should be centered on the middle third of the crib structure to ensure stability and load transfer into the floor or ground.

2) Slope force must be resisted by friction.

3) The base layer of the crib structure must be solid.

5.6 Chocking (Supporting a Load that is Not Flat)

Objects that are not flat can be supported by a crib. However, they must be properly chocked or wedged in place to eliminate undesired lateral movement.

NOTE: The Shoring Operations Guide (SOG), published by the U.S. Army Corps of Engineers, is a suggested reference. It contains detailed instructions, recommendations and precautions regarding proper shoring and chocking procedures.

5) Inspection

It is strongly recommended that the cribbing blocks be inspected before and after each use. Refer to the following steps:

1. Inspect the cribbing blocks for cuts, gouges and other visible damage. Do not use blocks with obvious structural damage.

2. Cribbing blocks will compress and retain the set. If compression exceeds 20 percent of the cribbing block cross dimension, or is greater than 2 inches [50 mm], closely inspect for fractures, splits or cracks.

3. If a cribbing block fractures during use so that splits and cracks are visible, mark the damaged cribbing block and (if safety allows) remove it from service at the earliest possible time. The load will first need to be removed from the crib so the block can be replaced.

4. Cribbing blocks damaged by chemical exposure should be removed from service. Recycle or properly dispose of such blocks. Swelling, melting, powder residue or other non-mechanical damage is evidence of chemical exposure.

Important: Keep chemically exposed cribbing blocks in a separate area to avoid migration of the attacking chemical into other non-contaminated cribbing blocks.

6) Cleaning

The cribbing blocks can be power washed to remove grit and dirt from their surfaces.

If foreign materials have become ground into the crib surface, or if the surface contains abrasions, cracks or cuts, the cribbing block should be removed from service and recycled.

Contaminated cribbing blocks that cannot be cleaned should be removed from service and disposed of.

7) Storage

To prolong their usable service life, store the cribbing blocks in a cool, dry area in an unloaded state. Do not store cribbing blocks outdoors.

Protect the cribbing blocks from freeze-thaw cycles. Store the blocks away from direct sunlight and other sources of ultraviolet (UV) radiation.

8) Recycling

Cribbing blocks are manufactured from recycled high-density polyethylene (HDPE) and small amounts of polypropylene (PP). Contact your local recycler to dispose of damaged and unusable cribbing blocks.
**Material Safety Data Sheet**

May be used to comply with OSHA’s Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

<table>
<thead>
<tr>
<th><strong>IDENTITY</strong> (As Used on Label and List)</th>
<th>Plastic Lumber</th>
</tr>
</thead>
</table>

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

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**Section I**

<table>
<thead>
<tr>
<th>Manufacturer’s Name</th>
<th>Emergency Telephone Number</th>
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<tbody>
<tr>
<td>Turtle Plastics</td>
<td>440-282-8008</td>
</tr>
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<table>
<thead>
<tr>
<th>Address (Number, Street, City, State, and ZIP Code)</th>
<th>Telephone Number for Information</th>
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<tr>
<td>7400 Industrial Parkway</td>
<td>440-282-8008</td>
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<table>
<thead>
<tr>
<th>Lorain OH 44053</th>
<th>Date Prepared</th>
<th>Signature of Preparer (optional)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1/9/12</td>
<td></td>
</tr>
</tbody>
</table>

**Section II • Hazardous Ingredients/Identity Information**

<table>
<thead>
<tr>
<th>Hazardous Components (Specific Chemical Identity; Common Name(s))</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
<th>Other Limits Recommended</th>
<th>% Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Section III • Physical/Chemical Characteristics**

<table>
<thead>
<tr>
<th>Boiling Point</th>
<th>N/A</th>
<th>Specific Gravity (H2O = 1)</th>
<th>.92-.95</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Vapor Pressure (mm Hg)</th>
<th>N/A</th>
<th>Melting Point</th>
<th>225º C</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Vapor Density (AIR = 1)</th>
<th>0</th>
<th>Evaporation Rate (Butyl Acetate = 1)</th>
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</table>

<table>
<thead>
<tr>
<th>Solubility in Water</th>
<th>0</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Appearance and Odor</th>
<th>No Odor</th>
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</thead>
</table>
### Section IV - Fire and Explosion Hazard Data

<table>
<thead>
<tr>
<th>Flash Point (Method Used)</th>
<th>Flammable Limits</th>
<th>LEL</th>
<th>UEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>645°</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- **Extinguishing Media**  
  Water-Foam-CO₂
- **Special Fire Fighting Procedures**  
  None
- **Unusual Fire and Explosion Hazards**  
  None

### Section V - Reactivity Data

<table>
<thead>
<tr>
<th>Stability</th>
<th>Unstable</th>
<th>Conditions to Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Very Strong Oxidizing Agents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Incompatibility (Materials to Avoid)**  
  None Known
- **Hazardous Decomposition or Byproducts**  
  None
- **Hazardous Polymerization**  
  May Occur
- **Will Not Occur**  
  X

### Section VI - Health Hazard Data

<table>
<thead>
<tr>
<th>Route(s) of Entry:</th>
<th>Inhalation?</th>
<th>Skin?</th>
<th>Ingestion?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- **Health Hazards (Acute and Chronic)**  
  None
- **Carcinogenicity:**  
  None
- **NTP?**  
  IARC Monographs?  
  OSHA Regulated?  
  None
- **Signs and Symptoms of Exposure**  
  None
- **Medical Conditions Generally Aggravated by Exposure**  
  None
- **Emergency and First Aid Procedures**  
  None
### Section VII • Precautions for Safe Handling and Use

<table>
<thead>
<tr>
<th>Steps to Be Taken in Case Material is Released or Spilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>As the end product (lumber) – Collect and restack Raw Material – Collect back into box for use; Saw Swarf (dust) – Brush up and dispose to landfill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispose to sanitary landfill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Precautions to Be taken in Handling and Storing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No special precautions – Good housekeeping practice should be followed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

### Section VIII • Control Measures

<table>
<thead>
<tr>
<th>Respiratory Protection (Specify Type)</th>
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</thead>
<tbody>
<tr>
<td>N/A</td>
</tr>
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<table>
<thead>
<tr>
<th>Ventilation</th>
<th>Local Exhaust</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>When Cutting</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical (General)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protective Gloves</th>
<th>Eye Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>When Cutting</td>
<td>When Cutting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Protective Clothing or Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work/Hygienic Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Hygiene</td>
</tr>
</tbody>
</table>

* U.S.G.P.O.: 1986 - 491 - 529/45775
To Whom This Concerns:

In November 2007, Mr. Anthony Petti, Operations Manager at Turtle Plastics, a manufacturer and distributor of products made from recycled HDPE plastic material in Lorain, Ohio, requested Tensile Testing Metallurgical Lab conduct a series of compression tests at room temperature on their cribbing products. Specifically, these tests were conducted on 2 x 4 x 18", 4 x 4 x 18", and 6 x 7 x 24" cribbing and blocking products used in the fields of emergency rescue and in various industrial/ manufacturing settings.

As no known ASTM standard exist for the testing of these products, several RT Compression Tests were performed using an ASTM E4 certified 150 ton testing machine. The crib blocks layouts were tested as directed by Turtle Plastics. Both 2-Member x 2 – Member (4- Point) box cribs, and 3- Member x 3- Member (9- Point) box cribs were erected from crib blocks supplied by Turtle. Additionally, as these crib blocks were designed with two different interlocking profiles, the compression tests were conducted by mating the profiles of each in construction of the box crib. Results of the compression tests are published in Tensile Testing Metallurgical Lab report: JA7-346-743 dated November 26, 2007, et al.

Sincerely,

Tensile Testing
4520 Willow Parkway
Cleveland OH 44125
Phone: 216-641-3290
Fax: 216-641-1223
## Tensile Testing Metallurgical Lab

**RT Compression Test | Load/Position | 150 Ton Testing Machine**

**Super Crib #2 | 6˝x7˝x24˝ | 9 Point Box Crib | Pyramid Mating | 4 Levels High | 1˝ Thick Full Contact | Steel Plate**

<table>
<thead>
<tr>
<th>Load Step #</th>
<th>Loading Force Lbs.</th>
<th>Initial Height In.</th>
<th>Loaded Height In.</th>
<th>Delta Change Height In.</th>
<th>Visual Testing Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>26-1/4</td>
<td></td>
<td></td>
<td>N/C</td>
</tr>
<tr>
<td>1</td>
<td>15,000</td>
<td>26-3/16</td>
<td>1/16</td>
<td>N/C</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30,000</td>
<td>26-1/16</td>
<td>3/16</td>
<td>N/C</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>45,000</td>
<td>26</td>
<td>1/4</td>
<td>N/C</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>60,000</td>
<td>25-7/8</td>
<td>3/8</td>
<td>25% Pyramid compression - top</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>75,000</td>
<td>25-13/16</td>
<td>7/16</td>
<td>33% Pyramid compression - top</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>90,000</td>
<td>25-3/4</td>
<td>1/2</td>
<td>33% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>105,000</td>
<td>25-11/16</td>
<td>9/16</td>
<td>33%-50% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>120,000</td>
<td>25-5/8</td>
<td>5/8</td>
<td>33%-50% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>135,000</td>
<td>25-5/8</td>
<td>5/8</td>
<td>65% Pyramid compression - top/bottom; slightly imbedded areas throughout</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>150,000</td>
<td>26-9/16</td>
<td>11/16</td>
<td>65% Pyramid compression - top/bottom; slightly imbedded areas at select locations</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>175,000</td>
<td>25-1/4</td>
<td>1</td>
<td>Lower back pyramids 90% compressed, minor imbedded areas at select location</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>200,000</td>
<td>25-3/16</td>
<td>1-1/16</td>
<td>90%-95% Overall pyramid compression, minor imbedded areas throughout</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>225,000</td>
<td>25</td>
<td>1-1/4</td>
<td>90%-95% Overall pyramid compression, minor imbedded areas throughout, middle crib slight distortion</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>250,000</td>
<td>24-11/16</td>
<td>1-9/16</td>
<td>95% Overall pyramid compression, minor imbedded areas throughout, slight overall distortion</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>298,000*</td>
<td>23-3/4</td>
<td>2-1/2</td>
<td>Flattened overall pyramid compression, minor imbedded areas throughout, slight overall distortion</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum allowable testing machine force*
## Tensile Testing Metallurgical Lab

**RT Compression Test | Load/Position | 150 Ton Testing Machine**

**Super Crib #3 | 6”x7”x24” | 4 Point Box Crib | Pyramid Mating | 4 Levels High | 1” Thick Full Contact | Steel Plate**

<table>
<thead>
<tr>
<th>Load Step #</th>
<th>Loading Force Lbs.</th>
<th>Initial Height In.</th>
<th>Loaded Height In.</th>
<th>Delta Change Height In.</th>
<th>Visual Testing Observations</th>
</tr>
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<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>1</td>
<td>15,000</td>
<td>26</td>
<td>1/4</td>
<td>25% Pyramid compression</td>
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</tr>
<tr>
<td>2</td>
<td>25,000</td>
<td>25-7/8</td>
<td>3/8</td>
<td>33% Pyramid compression - top/bottom</td>
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</tr>
<tr>
<td>3</td>
<td>35,000</td>
<td>25-3/4</td>
<td>1/2</td>
<td>50% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>45,000</td>
<td>25-11/16</td>
<td>9/16</td>
<td>50% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>60,000</td>
<td>25-1/2</td>
<td>3/4</td>
<td>65% Pyramid compression - top/bottom</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>75,000</td>
<td>25-3/8</td>
<td>7/8</td>
<td>75% Pyramid compression - top/bottom</td>
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</tr>
<tr>
<td>7</td>
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<td>25-1/4</td>
<td>1</td>
<td>85% Pyramid compression - top/bottom</td>
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<tr>
<td>8</td>
<td>110,000</td>
<td>25</td>
<td>1-1/4</td>
<td>90% Pyramid compression - top/bottom, bowing at ends of select cribs</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>130,000</td>
<td>24-5/8</td>
<td>1-5/8</td>
<td>95% Compressed pyramids - top/bottom, bowing at ends of select cribs, minor imbedding of select areas</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>150,000</td>
<td>24-1/16</td>
<td>2-3/16</td>
<td>Fully compressed pyramids, top/bottom, bowing at ends of select cribs</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>170,000</td>
<td>23-3/8</td>
<td>2-7/8</td>
<td>Fully compressed pyramids, top/bottom, major bowing and buckling of select cribs</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>190,000</td>
<td>22-3/8</td>
<td>3-7/8</td>
<td>Fully compressed pyramids, top/bottom, major overall bowing/buckling</td>
<td></td>
</tr>
</tbody>
</table>