

**CONSTRUCTION MATERIALS  
ENGINEERING STUDY  
BAR LIFT APPARATUS**

**Prepared For:  
Bar Lift Inc.  
McAllen Texas**

**Prepared By:  
Drash Consulting Engineers, Inc.  
Pharr, Texas**

**DCE Project No 204M2039  
February 14, 2005**





Geotechnical • Construction Materials • Environmental • Forensic

February 14, 2005

Mr. Ruben de Leon  
Bar Lift Inc.  
6900 North 10th Street #3  
McAllen, Texas 78504

**SUBJECT:**

Construction Materials Testing  
Services  
Testing and Evaluation of Bar Lift  
Reinforcing Steel Cover Separator  
Pharr Laboratory  
DCE Project N<sup>o</sup> 204M2039  
Report N<sup>o</sup> 004

Dear Mr. de Leon:

Drash Consulting Engineers, Inc. (DCE) is pleased to submit the enclosed construction materials engineering report for the testing conducted involving the CHAIR SUPPORT FOR METAL REINFORCEMENTS (Patent No.: US 6,732,484 B1) manufactured by Bar Lift Inc. in McAllen Texas. The report also includes testing of similar apparatus, provided by the Bar Lift manufacturer, in order to provide an accurate comparison between them.

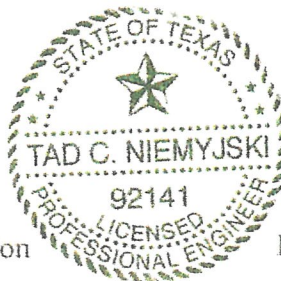
Our scope of services was performed in accordance with DCE Proposal N<sup>o</sup> M042043, dated May 4, 2004. Our work was authorized through signature of this proposal by Mr. Ruben de Leon of Bar Lift Inc. on May 5, 2004.

If you have any questions regarding our report, or if additional engineering recommendations are needed, please do not hesitate to contact us.

Very Truly Yours,  
Drash Consulting Engineers, Inc.

A handwritten signature in black ink, appearing to read "Luis Flores".

Luis G. Flores, Jr.  
Project Manager  
Materials Engineering Division



A handwritten signature in black ink, appearing to read "T.C. Niemjski".

Tad C. Niemjski, P.E.  
Project Manager  
Rio Grande Valley Office  
02-14-05

LF/TCN/yl - 204M2039-004

Copies Submitted: (10) Bar Lift Inc.; Mr. Ruben de Leon

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San Antonio • Laredo • Rio Grande Valley

## TESTING DESCRIPTION

The apparatus were tested for two different properties:

- The ability of the apparatus to withstand axial load; and
- the ability of the apparatus to allow concrete to fill the inside of it without any voids and/or honeycombing.

### **Axial load Testing**

The axial load testing was performed using a 10,000 lb testing frame of constant speed displacement. A 10,000 lb load cell was used to record the load. Each of the different apparatus were tested using a #4 rebar in order to better represent field conditions. It is important to note that this test only applies a vertical force at a controlled speed. In the field, the apparatus may be exposed to different loading conditions such as: torsion and/or lateral forces.

### **Void/Honeycombing Testing**

The void testing was performed by casting six (6) different arrangements using the Bar Lift apparatus. The molds used were approximately 24"L x 6"H x 8"W, and the rebar used was a #4 (0.5 inch diameter bar). The different arrangements included testing using the Bar Lift apparatus for two (2) different distances (concrete cover) between the edge of the mold and the steel reinforcement, namely 2" and 3". The other variation of the testing was changing the consistency of the concrete mixture in order to evaluate the potential of honeycombing and/or voids occurring within the Bar Lift apparatus.

The samples were cast at a ready-mix plant from a batch of approximately two (2) cubic yards of concrete. The first sample of concrete was obtained and tested to measure the slump to determine the consistency. The concrete was then poured into the forms with the Bar Lift apparatus in place holding a #4 rebar at the center of the mold. The concrete was consolidated using only a standard 5/8-inch diameter tamping-rod that is 24 inches long with rounded ends (no vibration was used). Consolidation was done by penetrating the concrete with the tamping rod in multiple locations as many times as needed to provide a uniform distribution and proper consolidation of the concrete. Consolidation was done in a single layer to better represent field conditions.

The second and third samples of the concrete were obtained by adding water to the remaining concrete in the ready-mix truck to increase the concrete slump. Both samples were tested and compacted using the same procedure as described above.

The different consistencies of the samples were measured using the Standard Test Method for Slump of Hydraulic Cement Concrete (ASTM C 143); test results were as follows:

Sample No.	Slump (in)
1	4.5
2	6.5
3	8.0

The hardened concrete samples were cut, using a diamond blade, approximately at the center of the Bar Lift apparatus where honeycombing and/or voids have the greater potential to appear.

## TESTING RESULTS

### Axial load testing

Photographs of the different apparatus are presented in Appendix A. In each of these photographs, arrows show the direction of the main deformations of each apparatus.

The table below describes the test sample with corresponding figure numbers, the peak load and displacement at the time of peak load as follows:

Figure	Description	Peak Load (lb)
1	The apparatus is a 2½" x 2½" x 3½" box made of polypropylene plastic and can hold #3 and #4 rebar in this orientation. The height of the device at this orientation is 2½".	432
2	The apparatus is a 2½" x 2½" x 3½" box made of polypropylene plastic and can hold #4 and #5 rebar in this orientation. The height of the device at this orientation is 3½".	297
3	The apparatus is a 2½" x 2½" x 3½" box made of polypropylene plastic and can hold 6, 8, and 10 gauge wire mesh in this orientation. The height of the device at this orientation is 2½".	2,454
4	The apparatus is a 2½" x 2½" x 3½" box made of acetal plastic and can hold #3 and #4 rebar in this orientation. The height of the device at this orientation is 2½".	884
5	The apparatus is a 2½" x 2½" x 3½" box made of acetal plastic and can hold #4 and #5 rebar in this orientation. The height of the device at this orientation is 3½".	637
6	The apparatus is a 2½" x 2½" x 3½" box made of acetal plastic and can hold 6, 8, and 10 gauge wire mesh in this orientation. The height of the device at this orientation is 2½".	3,757

### Void/Honeycombing Testing

Photographs in Appendix B indicate that the voids/honeycombs in the concrete were reduced with higher slumps. More aggressive vibration of the concrete, such as the use of a mechanical vibrator, should increase the degree of consolidation (decrease voids) especially at lower slumps. **Appropriate use of a spud vibrator is considered good practice for concrete placement.**

### SUMMARY

The Bar Lift apparatus can withstand axial loads of over 400 pounds (polypropylene) and 850 pounds (acetal) in its 2½-inch position and axial loads of nearly 300 pounds (polypropylene) and 600 pounds (acetal) in 3½-inch position. When the Bar Lift apparatus is used for holding wire mesh it can withstand loads of over 2,240 pounds (polypropylene) and 3,700 pounds (acetal). Testing was done in a single unit. It is presumable that multiple placements will result in grater load bearing. Another of the main advantages of the Bar Lift is that due to its geometry the Bar Lift apparatus will be capable of supporting torsion and lateral forces without failing. The Bar Lift apparatus is non-corrosive.

The Bar Lift apparatus is capable of holding its position by clamping into the reinforcing steel without falling or moving. This is especially important when job personnel walk over the reinforcing steel or when it is used on sloping or vertical walls. The Bar Lift apparatus is capable of providing a constant clear cover of the reinforcing steel in the concrete with insignificant voids as long as **proper techniques are used in placing the concrete.** For the testing performed on this study the concrete samples were only compacted by the use of a tamping rod. **The use of internal and/or mechanical vibration will further diminish the amount of voids in the concrete.**

**APPENDIX A**

**Compression Test Photographs**

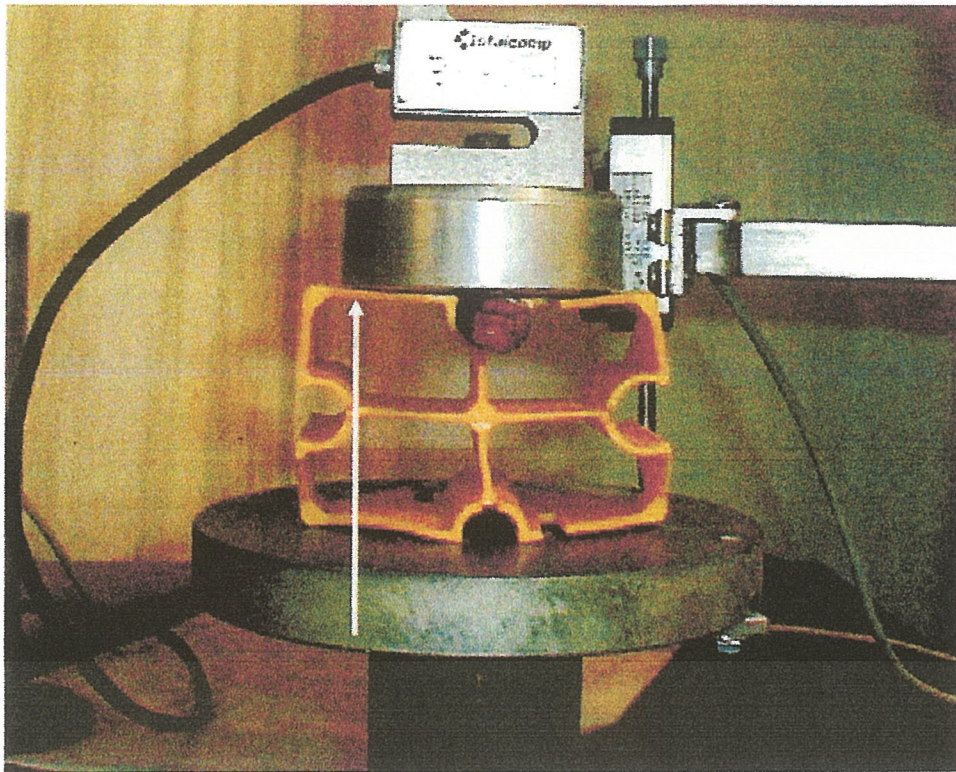


Figure 1

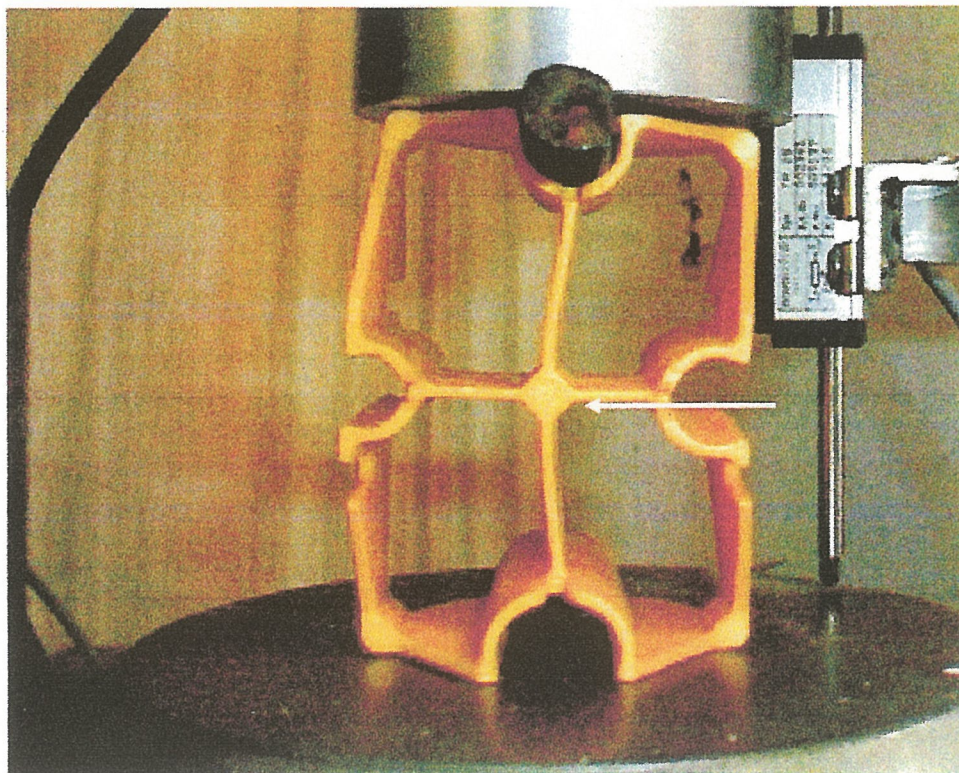


Figure 2

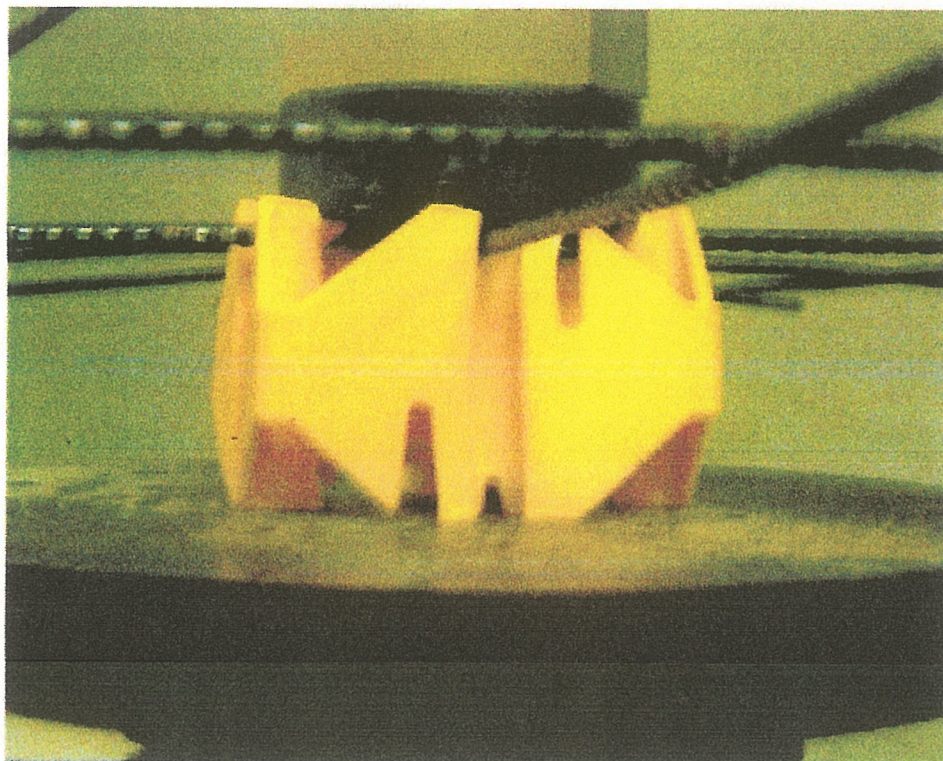


Figure 3

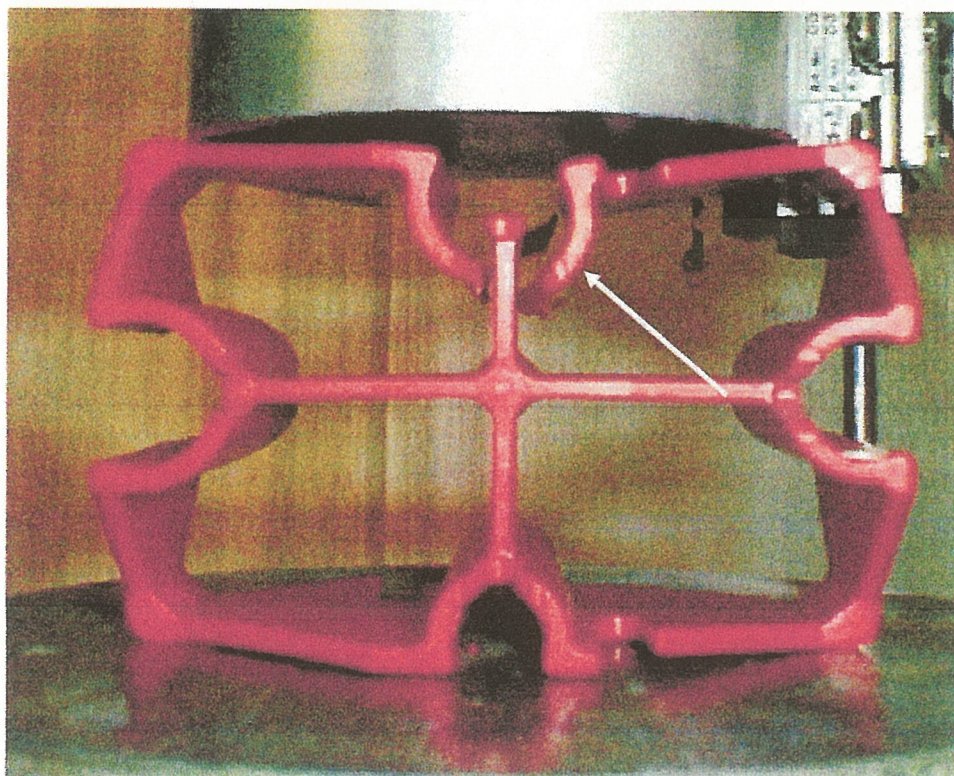


Figure 4



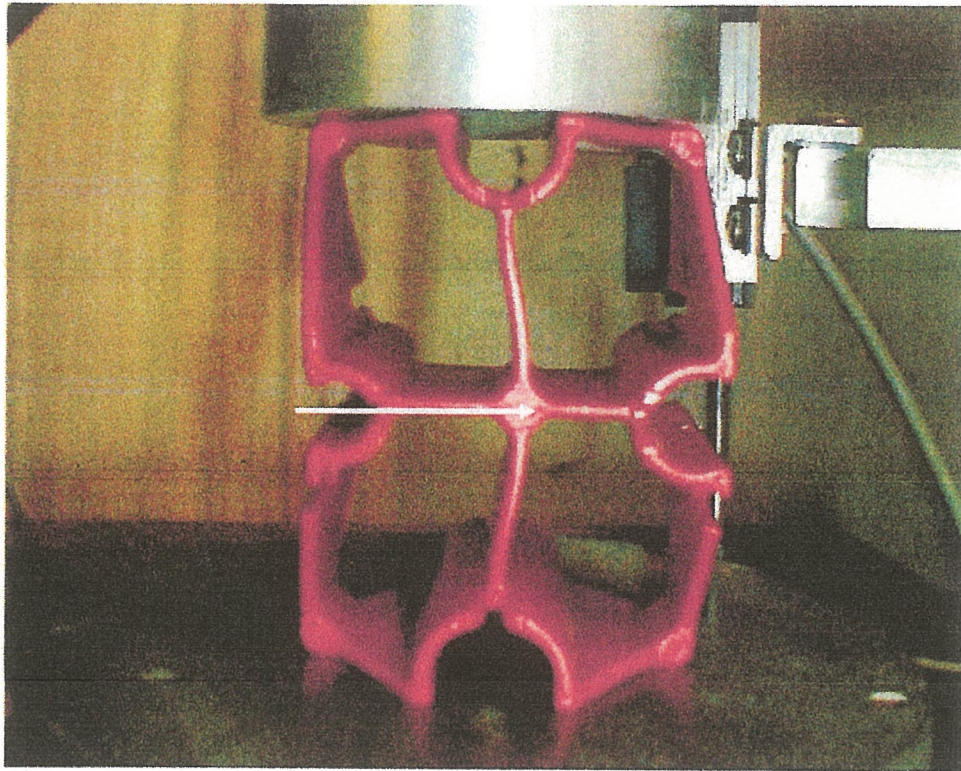


Figure 5

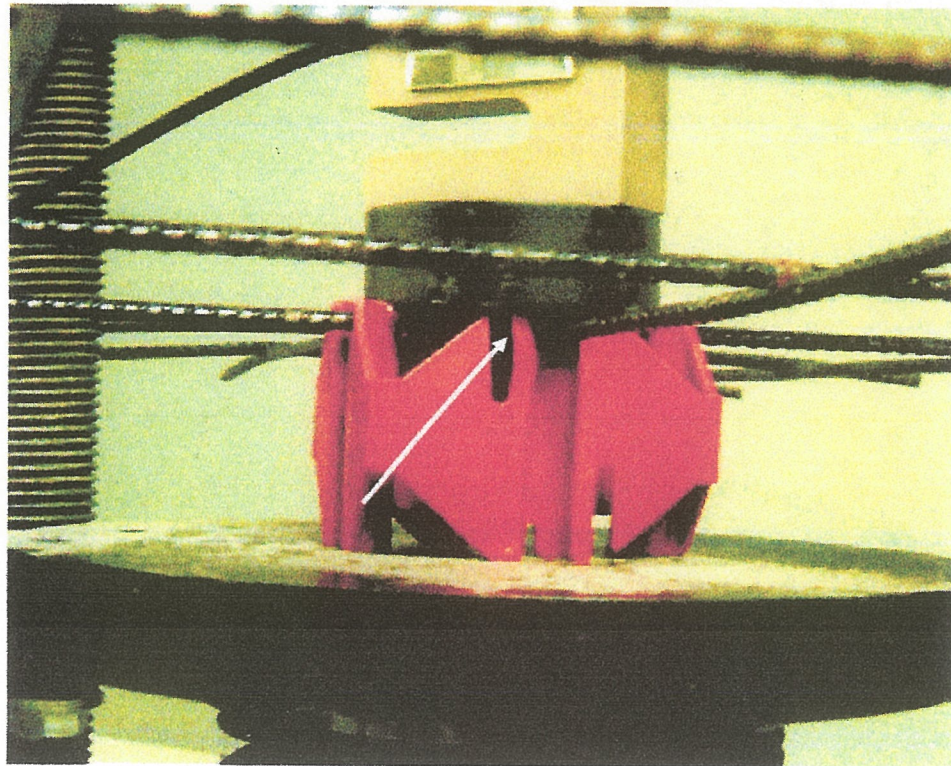


Figure 6

**APPENDIX B**

**Void/Honeycombing Photographs**

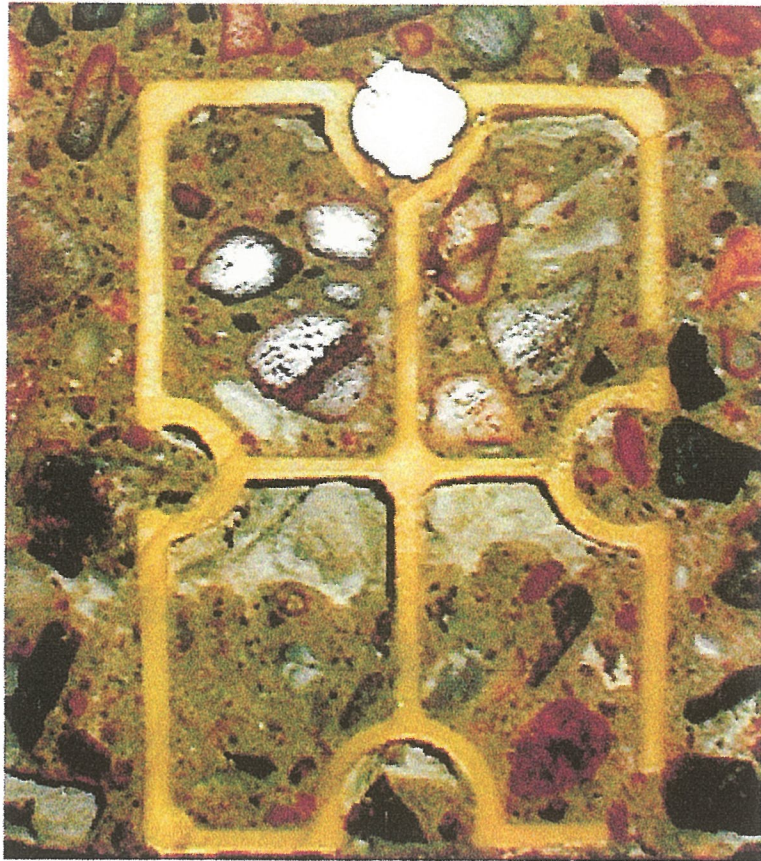


Figure 7 4.5" Slump, 3" of clear cover

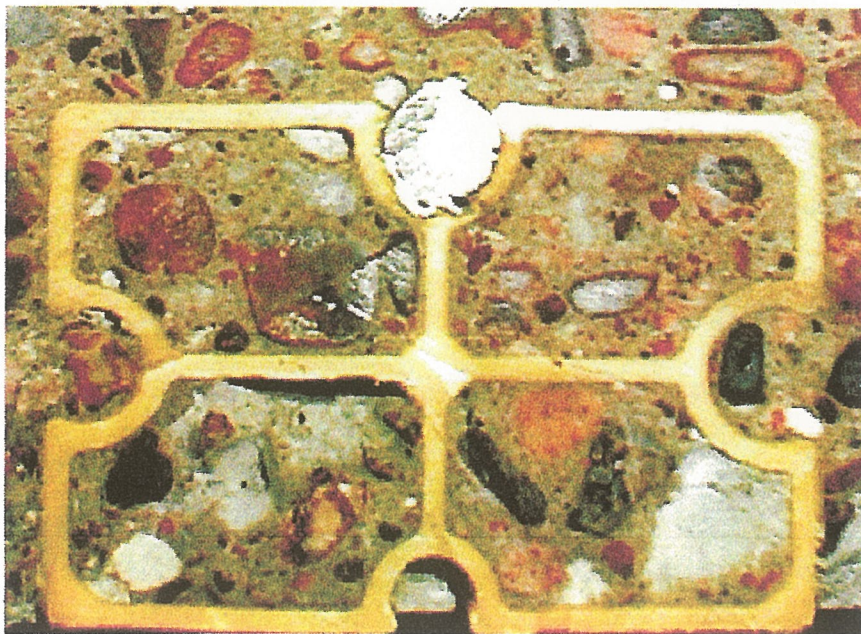


Figure 8 4.5" Slump, 2" of clear cover



Figure 9 6.5" Slump, 3" clear cover

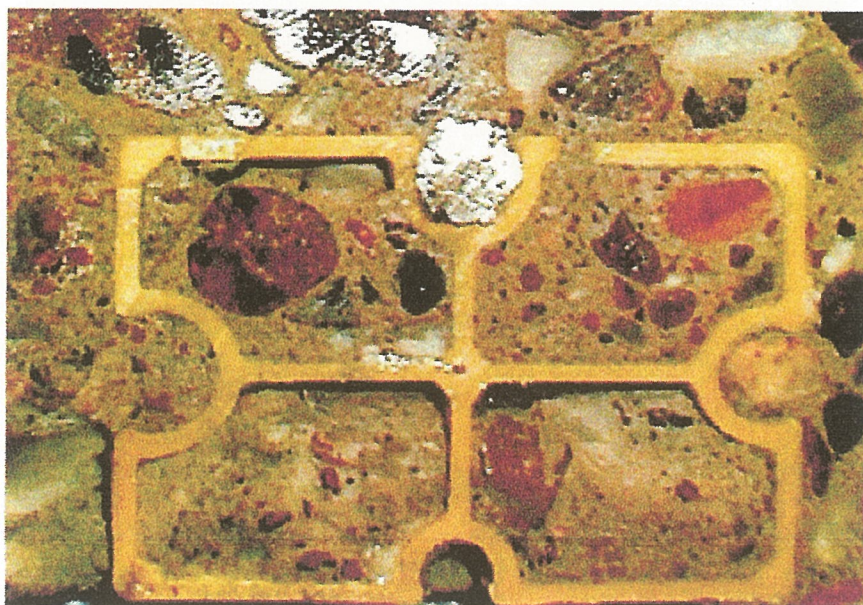


Figure 10 6.5" Slump, 2" clear cover

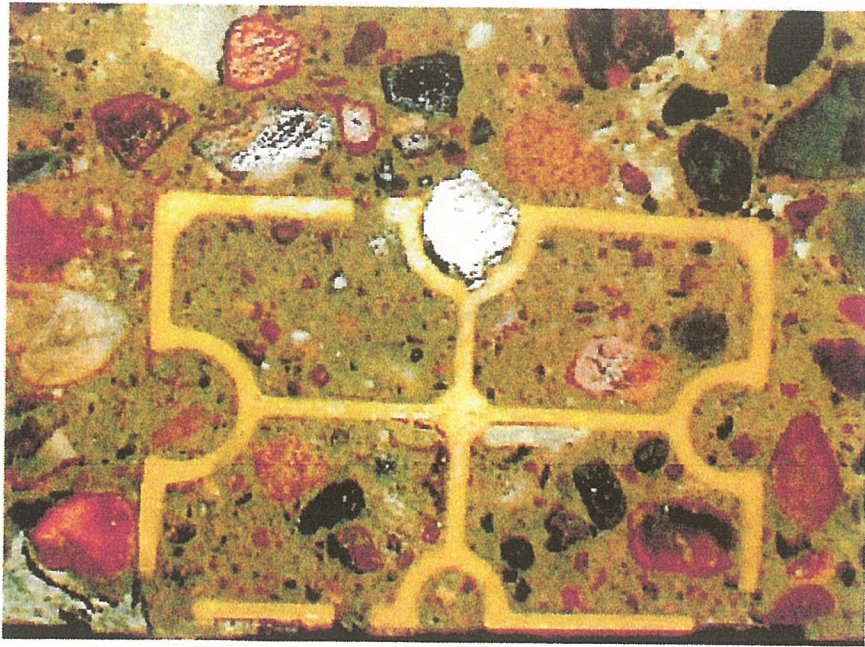


Figure 11 8" Slump, 2" clear cover

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6900 N 10 th, Suite # 3  
McAllen, TX 78504

**RESEARCH REPORT: RR 25627**

Attn: Ruben De Leon  
(956) 533-9996

Local Representative: Israel Ceballos  
(818) 442-1719

**GENERAL APPROVAL - Renewal - Bar-Lift, Inc. Plastic Chair to support reinforcement for concrete placement.**

**DETAILS**

There are two sizes of Plastic Chair being manufactured : 2 ½ " height and 3 ½" height. The Plastic Chair is used for the concrete placement of residential and commercial foundation to support: 6 Ga., 8 Ga. and 10 Ga. wire mesh, and #3, #4 and #5 rebar.

**Conditions of Approval:**

1. Bar-Lift Plastic Chair is used to support reinforcement for concrete placement of residential and commercial foundation.
2. The Plastic Chair delivered to the job site shall be in a green nylon bag labeled with Bar-Lift Inc. and product specification.

**DISCUSSION**

The approval is based on tests of the ability of the chair to withstand axial load; and the ability of the chair to allow concrete to fill inside of it without any voids and/or honeycombing. Test reports, details and other pertinent data on file in the office of the Engineering Research Section.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

RR 25627  
Page 1 of 2

Bar-Lift Inc.  
RE: Plastic Chair

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

*Yueuan Chou*

YEUAN CHOU, Chief  
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Los Angeles, CA 90031  
Phone (213) 485-2376  
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**Texas Department of Transportation**

RESEARCH AND TECHNOLOGY IMPLEMENTATION OFFICE  
P.O. BOX 5080 • AUSTIN, TEXAS 78763-5080 • (512) 416-4730

September 9, 2011

Mr. Ruben De Leon  
Bar Lift Inc.  
6900 N. 10<sup>th</sup>, Suite #3  
McAllen, Texas 78704

Re: Product Evaluation 12-2756  
"Bar-Lift Rebar Chair"

Dear Mr. De Leon:

The product information you submitted has been reviewed by engineers in our Construction Division. They have determined that your product, the Bar-Lift Rebar Chair, may be used on TxDOT work. The supervising TxDOT Engineer's concurrence will be required before the use of your product on a specific job. This letter may be used in the request for the Engineer's job or site specific approval.

The reviewer's comments follow:

Standard Specification 360 only requires the following:

B. Reinforcing Steel. Provide Grade 60 deformed steel for bar reinforcement in accordance with Item 440, "Reinforcing Steel." Provide approved positioning and supporting devices (baskets and chairs) capable of securing and holding the reinforcing steel in proper position before and during paving. Provide corrosion protection when shown on the plans.

There are no specific materials specification requirements for the chairs and TxDOT has no approved list. The project engineer approves on a project by project basis.

If you have questions, please contact me at 512-416-4739.

Sincerely,

*(original signature on file)*

Duncan Stewart, P.E., Ph.D.

Research and Technology  
Implementation Office

cc: Darren Hazlett, PE, CST