HI-SPEED
INDUSTRIAL SERVICE

KEEPING YOUR FACILITY UP TO SPEED
EVERY DAY SINCE 1946

LR Motor Shop Repairs

Job Number 101099

Prepared for Reynolds Metals company

1333 highway 270
Malvern AR 72104

Table of Contents

Hi-Speed Industrial Service
7030 Ryburn Dr
Millington, Tn 38053
901-873-5300

DC Repair Report

Reynolds Metals company
1333 highway 270
Malvern, AR 72104

FolderID: 101099
FormID: 16241864

DC Repair Report Rev. 2

Location:	Shop
Job Number:	100712
Serial Number:	JR-1-539 KR
Status:	In For Repair
Description:	16HP GE 400/1800RPM CD409AT

Hi-Speed Job Number:	100712
Manufacturer:	GE
Product Number :	5CD284KA855A801
Serial Number:	JR-1-539 JR
HP/KW:	16 (HP)
RPM:	400
Frame:	CD409AT
Armature Voltage:	240 (Volts)
Armature Current:	55 (Amps)
Field Voltage:	240 (Volts)
Field Current :	2.94 (Amps)
J-Box Included:	No
Bearing RTDS:	No
Winding RTDS:	No
Mounting Orientation :	Horizontal

Overall Condition

1. Describe the Overall Condition of the Equipment as Received
2. Nameplate Picture
3. Distance From the End of the Shaft to the end of the Face of the Sheave/Coupling

Initial Mechanical/Electrical

4. Does the Shaft Turn Freely?
5. Does Shaft Have Visible Damage?
6. Assembled Shaft Runout
7. Assembled Shaft End Play
8. Air Gap Variation <10%
9. Lead Condition
10. Lead Length
11. Frame Condition
12. Fan Condition
13. Brush Information

Brush Number	Quantity	Condition

14. Brush Holder Condition - Verify proper gap to Commutator

Incoming Electrical Test

15. General Condition of the Armature/Commutator
16. Armature Insulation Resistance to Ground
17. Field Circuit Insulation Resistance to Ground

18.	Interpole Circuit Insulation Resistance to Ground		
19.	Total Field Ohms		
20.	Field Ohms		
	Between F1/F2	Between F3/F4	
21.	MegOhms between Fields and Series		
22.	Series Drop Test 1&2		
	Series 1	Series 2	
23.	Series Drop Test 3&4		
	Series 3	Series 4	
24.	Field Drop Test Fields 1&2		
	Total AC Voltage	Field #1	Field #2
25.	Field Drop Test Fields 3&4		
	Field #3	FIeld #4	Field #2
26.	Field Drop Test Fields 5&6		
	Field #5	FIeld #6	Field #2
27.	Field Drop Test Fields 7&8		
	Field #7	FIeld #8	Field #2
28.	Interpole Drop Test 1&2		
	Total AC Voltage	Interpole #1	Interpole #2
29.	Interpole Drop Test 3&4		
	Interpole #3	Interpole #4	Field #2
30.	Interpole Drop Test 5&6		
	Interpole #5	Interpole #6	Field #2
31.	Interpole Drop Test 7&8		
	Interpole #7	Interpole #8	Field #2
32.	Armature Number of Bars - Bar to Bar Test		
	Number of Bars	Bar to Bar Test	

Mechanical Inspection

33.	Shaft Runout Drive End		
34.	Shaft Runout Armature		
	Drive End Bearing Journal	Armature Core	ODE Bearing Journal
35.	Drive End Bearing Number		
36.	Drive End Bearing Quantity		
37.	Drive End Bearing Type		
38.	Drive End Lubrication Type		
39.	Drive End Bearing Insulation or Grounding Device?		

40. Drive End Wavy Washer/Snap-Ring Other Retention Device?
41. Drive End Bearing Condition
42. Opposite Drive End Bearing Number
43. Opposite Drive End Bearing Quantity
44. Opposite Drive End Bearing Type
45. Opposite Drive End Lubrication Type
46. Opposite Drive End Bearing Insulation or Grounding Device?
47. Opposite Drive End Wavy Washer/Snap-Ring Other Retention Device?
48. Opposite Drive End Bearing Condition
49. Signature of Technician who Performed Teardown
50. List Parts Needed Prior to Reassembly

Mechanical Fits - Armature

51. Coupling Fit Closest to Bearing Housing

0 Degrees	60 degrees	120 degrees

52. Coupling Fit Closest to the End of the Shaft

0 Degrees	60 degrees	120 degrees

53. Drive End Bearing Shaft Fit

0 Degrees	60 Degrees	120 Degrees

54. Drive End Bearing Shaft Fit Condition
55. Opposite Drive End Bearing Shaft Fit

0 Degrees	60 Degrees	120 Degrees

56. Opposite Drive End Bearing Shaft Fit Condition
57. Shaft Air Seal Fits

Drive End Air Seal	Opposite Drive End Air Seal

Mechanical Fits- Bearing Housings

58. Drive End - End Bell Bearing Fit

0 Degrees	60 Degrees	120 Degrees

59. Drive End - Endbell Bearing Fit Condition
60. Opposite Drive End - End Bell Bearing Fit

0 Degrees	60 Degrees	120 Degrees

61. Opposite Drive End - Endbell Bearing Fit Condition
62. Bearing Cap Condition

Drive End	Opposite Drive End

63. End Bell Air Seal Fits

Drive End Air Seal	Opposite Drive End Air Seal

64. List any Machine work Needed Below
65. Signature of Technician Performing Measurements

Root Cause of Failure

66. Failure Locations

67. Root Cause of Failure

Commutator Data

68. Total Copper Segment Length
69. Number of Bars
70. Number of Wires Per Copper Bar and Size

Number of Wires per Bar	Wire Size

71. Equalizers per Copper Bar and Equalizer Wire Size

Equalizers per Bar	Wire Size

72. Document Commutator Diameter, Minimum and Max

Current Comm Diameter	Minimum Comm Diameter	Maximum Comm Diameter

73. Commutator Shaft Diameter

Front Shaft Diameter	Back Shaft Diameter

74. Commutator Type
75. Commutator Bore
76. Signature of Technician Recording Data

Dynamic Balance Report

77. Rotor Weight and Balance Grade

Rotor Weight	Balance Grade

78. Initial Balance Readings

Drive End Readings	Opposite Drive End Readings

79. Final Balance Readings

Drive End Readings	Opposite Drive End Readings

80. Signature of the Balance Technician

Post Armature Rewind Testing

81. Post Rewind Armature Insulation Resistance to Ground
82. Post Rewind Field Circuit Measure the Insulation Resistance to Ground
83. Post Rewind Armature Number of Bars - Bar to Bar Test

Number of Bars	Bar to Bar Test

84. Post Rewind Field Circuit Insulation Resistance to Ground
85. Post Rewind Interpole Circuit Insulation Resistance to Ground
86. Post Rewind Field Drop Test Fields 1&2

Total AC Voltage	Field #1	Field #2

87. Post Rewind Field Drop Test Fields 3&4

Field #3	FIeld #4	Field #2

88. Post Rewind Field Drop Test Fields 5&6

Field #5	FIeld #6	Field #2

89.	Post Rewind Field Drop Test Fields 7&8		
	Field #7	FIeld #8	Field #2
90.	Post Rewind Interpole Drop Test 1&2		
	Total AC Voltage	Interpole #1	Interpole #2
91.	Post Rewind Interpole Drop Test 3&4		
	Interpole #3	Interpole #4	Field #2
92.	Post Rewind Interpole Drop Test 5&6		
	Interpole #5	Interpole #6	Field #2
93.	Post Rewind Interpole Drop Test 7&8		
	Interpole #7	Interpole #8	Field #2
Post Mechanical Repair			
94.	Post Repair Coupling Fit Closest to Bearing Housing		
	0 Degrees	60 degrees	120 degrees
95.	Post Repair Coupling Fit Closest to the End of the Shaft		
	0 Degrees	60 degrees	120 degrees
96.	Post Repair Drive End Bearing Shaft Fit		
	0 Degrees	60 Degrees	120 Degrees
97.	Post Repair Drive End Bearing Shaft Fit Condition		
98.	Post Repair Drive End Opposite Drive End Bearing Shaft Fit		
	0 Degrees	60 Degrees	120 Degrees
99.	Post Repair Drive End Opposite Drive End Bearing Shaft Fit Condition		
100.	Post Repair Drive End - End Bell Bearing Fit		
	0 Degrees	60 Degrees	120 Degrees
101.	Post Repair Drive End - Endbell Bearing Fit Condition		
102.	Post Repair Opposite Drive End - End Bell Bearing Fit		
	0 Degrees	60 Degrees	120 Degrees
103.	Post Repair Opposite Drive End - Endbell Bearing Fit Condition		
104.	Post Repair Bearing Cap Condition		
	Drive End	Opposite Drive End	
105.	Post Repair End Bell Air Seal Fits		
	Drive End Air Seal	Opposite Drive End Air Seal	
106.	Signature of Tech Performing Mechanical Repairs		
Assembly			

107. Take Pictures of all Major Components Prior to Reassembly

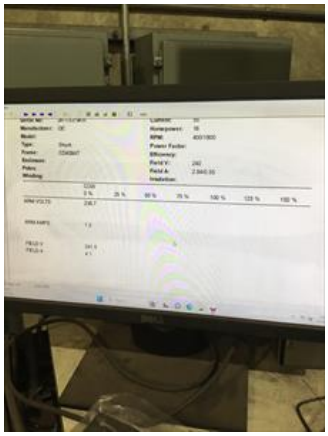
108. Verify Brush Box Holders Have the Proper Clearance, and Brushes have been Seated Properly

109. Assembled Shaft End Play and Runout

Shaft Endplay	Shaft Runout

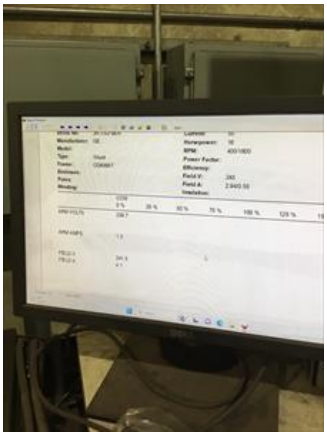
110. Perform No-Load Test Run, Record Armature Voltage and Current

Voltage	Current
239.7	**1.3**



111. Perform No-Load Test Run, Record Field Voltage and Current

Voltage	Current
241.5	**4.1**



112. Document Vibration Readings Drive End

Horizontal	Vertical	Axial

113. Document Vibration Readings Opposite Drive End

Horizontal	Vertical	Axial

114. Perform Full-Load Test Run, Record Armature Voltage and Current

Voltage	Current

115. Perform Full-Load Test Run, Record Field Voltage and Current

Voltage	Current

116. Document Vibration Readings Under Full Load Drive End

Horizontal	Vertical	Axial

117. Document Vibration Readings Under Full Load Opposite Drive End

Horizontal	Vertical	Axial

118. Ambient Temperature

119. Drive End Bearing Temps Under Full Load

5 Minutes	10 Minutes	15 Minutes

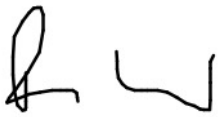
120. Opposite Drive End Bearing Temps Under Full Load

5 Minutes	10 Minutes	15 Minutes

121. Final Test Run Sign-Off

122. Document Final Condition With Pictures

123. Final QC Sign-Off **RW**



STANDARD TERMS AND CONDITIONS FOR PURCHASE OF GOOD AND/OR SERVICES

1. **APPLICABILITY.** The sale of any and all goods and/or services by Mock, Inc. d/b/a Hi-Speed Industrial Service ("Hi-Speed") shall be specifically conditioned upon and subject to the following terms and conditions which are incorporated by reference into any contracts and purchase orders with Hi-Speed, and which shall form and become a part of any agreement related thereto. Buyer's acceptance of any offer or quotation made by Hi-Speed for sale of any goods or services is expressly made subject to the terms and conditions set forth herein and to be so effective, Buyer need not sign or approve these Terms and Conditions to be bound hereunder provided a copy of same is provided to Buyer through any means. None of the terms and conditions contained herein may be added to, expanded, changed, modified, superseded or otherwise altered except as revised in writing and duly executed by Hi-Speed, and all orders received by Hi-Speed shall be governed only by the terms and conditions contained herein, notwithstanding any terms, conditions or provisions of any purchase order, release order, authorization or any other form issued by the Buyer. Hi-Speed hereby objects to any additional, modified, changed, deleted, altered or other terms and conditions not contained herein and notifies Buyer that any such terms or provisions are expressly rejected by Hi-Speed.
2. **PRICE.** All quoted prices shall remain firm and binding for a period of thirty (30) days from the date of quotation or for the period specifically stated in the quotation. The price for any and all goods and/or services ordered or approved by Buyer after thirty (30) days from the date of any quotation are subject to any increase in price that may occur after the expiration of thirty (30) days from the issuance of the quotation and the date the Buyer releases any shipment.
3. **SCOPE OF GOODS AND/OR SERVICES.** The goods and/or services provided by Hi-Speed pursuant to any quotation shall be limited exclusively to those goods and/or services expressly identified therein. Hi-Speed does not assume any responsibility and/or liability for the failure to provide any other goods and/or services not identified in any quotation. Modifications, additions or deletions to or from the scope referenced in any quotation shall only bee effective if evidenced in writing and signed by Hi-Speed. The sale of any of all goods and/or services affected by such modification, addition or deletion shall be subject to these same Standard Terms and Conditions whether or not referenced therein.
4. **BILLING AND PAYMENT TERMS.** Hi-Speed shall invoice Buyer for all goods and/or services as same are rendered at the address listed on the quotation. Payments for all goods and/or services shall be due thirty (30) days from the date of the current invoice or as otherwise set forth in the quotation. Late payments are subject to a late fee of 5% of the total invoice amount. Recurring late payments may lead to a deposit requirement on future services or sale of goods. Buyer shall be liable to Hi-Speed for any and all fees and expenses incurred by Hi-Speed to collect any invoices or to enforce these Standard Terms and Conditions, including but not limited to, attorney's fees.
5. **DELIVERY OF GOODS AND/OR SERVICES.** Unless otherwise identified in the quotation, all shipments are F.O.B. Hi-Speed's warehouse and the title to and all risk of loss with respect to any goods shipped shall pass to Buyer when such goods are delivered to the carrier at Hi-Speed's warehouse. Hi-Speed will use its best efforts to affect delivery by the date or dates specified in the quotation. However, Hi-Speed shall not be liable for delay in or failure to make shipment, or to perform services, by any identified date for any reason whatsoever, including but not limited to, causes beyond its reasonable control, such as strikes, fires, floods, epidemics, quarantines, restrictions, severe weather, embargos, acts of God, or public enemy, war, riot, delays in transportation or the inability to obtain necessary labor, materials or manufacturing facilities.
6. **DELIVERY SITE AND TIME FOR PERFORMANCE.** Hi-Speed and Buyer agree that time is of the essence for the purchase order and that Buyer shall fully cooperate with Hi-Speed in order to allow Hi-Speed full access to prosecute its work diligently and in an orderly manner. Buyer shall assist Hi-Speed in every way possible to avoid delaying, disrupting or interfering with the progress of Hi-Speed's work at the project site. In the event Hi-Speed's work is delayed, hindered, suspended, disrupted, re-sequenced or interfered with or rendered less efficient or more costly or adversely affected in any way as a result of acts or omissions of Buyer or other contractors or employees of Buyer or by any other reason beyond Hi-Speed's control and without the fault of Hi-Speed, then, in such event, Buyer shall be liable to Hi-Speed for any damages, additional costs, expenses, labor, materials, man hours, acceleration costs, overtime, additional jobsite overhead, extended home office overhead, and any and all other direct and indirect expenses of whatsoever nature or kind, caused in whole or in part, as a result of any of the above-referenced occurrences. Hi-Speed's project records will be the basis for computing the additional costs and damages of Hi-Speed's labor, materials, expenses and overhead related to such changes. BUYER WARRANTS THAT THE SITE FOR DELIVERY OR INSTALLATION OF ANY GOODS AND/OR FOR THE PERFORMANCE OF ANY SERVICES SHALL BE READY AND ADEQUATE FOR HI-SPEED'S DELIVERY OF GOODS AND/OR PERFORMANCE OF SERVICES AND THAT HI-SPEED SHALL HAVE FULL ACCESS THERETO, FREE OF ALL OBSTRUCTIONS. BUYER SHALL ASSUME ALL EXTRA COSTS ASSOCIATED WITH HI-SPEED'S INABILITY TO INSTALL ANY GOODS OR PERFORM ANY SERVICES AS A RESULT OF BUYER'S FAILURE TO COMPLY WITH THIS PROVISION. HI-SPEED MAY NOT INSPECT THE SITE PRIOR TO DELIVERY AND/OR INSTALLATION OF GOODS AND/OR PERFORMANCE OF SERVICES AND MAKES NO WARRANTY AS TO THE SUFFICIENCY OF THE SITE FOR THE DELIVERY AND/OR INSTALLATION OF GOODS AND/OR THE PERFORMANCE OF SERVICES AT SUCH SITE.
7. **INSPECTION/ACCEPTANCE.** All goods and services ordered pursuant to any quotation shall be subject to inspection by Buyer after delivery or performance to determine conformity with the quotation and/or purchase order and Hi-Speed's advertised or published specifications. Buyer shall have a period of thirty (30) days from shipment of goods at the delivery destination specified in the quotation within which to inspect the goods for conformity with the quotation, order and/or Hi-Speed's advertised and published specifications and to provide Hi-Speed with written notice of any discrepancy or rejection. Buyer shall have a period of thirty (30) days following completion of any services within which to inspect the services for conformity with the quotation, purchase order and/or Hi-Speed's advertised and published specifications and to provide Hi-Speed with written notice of any discrepancy or rejection. If the goods delivered or services performed do not so conform, upon delivery of notice to Hi-Speed of any discrepancy, nonconformance or rejection, Hi-Speed shall have sixty (60) days to cure the alleged discrepancy and/or nonconformance. If Hi-Speed fails to cure in this time period, Buyer shall have the right to reject such goods or services. After the cure period, goods that have been delivered and rejected, in whole or in part, shall be returned to Hi-Speed. Buyer shall notify Hi-Speed and arrange for the return of the goods as required. Should such non-conforming services be rejected Hi-Speed shall, at its sole cost, re-perform the non-conforming services. Inspection or failure to inspect on any occasion shall not affect Buyer's rights under the warranty provisions herein.
8. **WARRANTIES.** Hi-Speed warrants that all goods shall conform in all material aspects to the goods identified in the quotation to Buyer and/or purchase order, and Hi-Speed makes to Buyer the manufacturer's express warranty for any goods sold to Buyer, which is offered by the manufacturer at the time of acceptance of any quotation by Buyer. This warranty is conditioned upon the installation, operation, and maintenance of the goods in accordance with the manufacturer's recommendations and/or standard industry practice and the goods at all times being operated or used under normal operating conditions for which they were designed. Hi-Speed, at its sole option, will repair or

replace any defective or non-conforming goods in accordance with the applicable manufacturer's warranty. Warranty for any defective or incorrect parts is limited to the repair or replacement of those parts. Hi-Speed warrants that all services will conform in all material respects to the description of services identified in the quotation and will be performed in a good and workmanlike manner in accordance with industry practices and standards. Should the services be reasonably rejected or not conform with the foregoing warranties, Hi-Speed shall, at its sole cost, re-perform the defective or nonconforming services. Notwithstanding the foregoing, these warranties do not extend to goods or services to the extent that such goods have been subject to misuse, neglect or abuse not caused by Hi-Speed or have been used in violation of the approved written instructions furnished to Buyer. THE FOREGOING REPRESENTS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY HI-SPEED WITH RESPECT TO ALL GOODS SOLD AND IS IN LIEU OF ALL OTHER WARRANTIES EITHER EXPRESS OR IMPLIED. HI-SPEED EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICLAR USE OR PURPOSE. BUYER WAIVES ANY CLAIM THAT THESE EXCLUSIONS OR LIMITATIONS DEPRIVE IT OF AN ADEQUATE REMEDY AT EQUITY OR LAW OR CAUSE THIS AGREEMENT TO FAIL IN ITS ESSENTIAL PURPOSE. BUYER SHALL BE ENTITLED TO NO OTHER REMEDY OTHER THAN AS SET FORTH HEREIN, REGARDLESS OF THE CLAIM OR CAUSE OF ACTION, WHETHER BASED IN CONTRACT, TORT, NEGLIGENCE, GOODS LIABILITY, STRICT LIABILITY OR OTHERWISE.

9. **LIMITATION OF DAMAGES.** HI-SPEED SHALL HAVE NO LIABILITY TO BUYER WITH RESPECT TO THE SALE OR DELIVERY OF ANY GOODS OR THE REPAIR THEREOF OR WITH RESPECT TO THE SALE OR PERFORMANCE OF ANY SERVICES, FOR LOST PROFITS, SPECIAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE OR INCIDENTAL DAMAGES OF ANY KIND OR NATURE WHETHER ARISING IN CONTRACT, TORT, GOODS LIABILITY OR OTHERWISE, EVEN IF HI-SPEED WAS ADVISED OF THE POSSIBILITY OF SUCH LOSS OR DAMAGES. HI-SPEED SHALL NOT BE LIABLE FOR ANY DAMAGES OR DELAYS CAUSED BY ANY FAILURE TO MAKE ANY DELIVERY OF GOODS BY ANY EXPECTED TIME OR DATE OR THE FAILURE TO PROVIDE OR COMPLETE ANY SERVICES BY ANY EXPECTED DATE OR TIME. IN NO EVENT SHALL HI-SPEED BE LIABLE TO BUYER FOR ANY DAMAGES WHATSOEVER IN EXCESS OF THE TOTAL PRICE PAID FOR ALL GOODS AND/OR SERVICES HEREUNDER OR REFERENCED IN ANY QUOTATION OR THE PURCHASE ORDER.
10. **SEVERABILITY.** The partial or complete invalidity of any provision of these Standard Terms and Conditions shall not affect the enforceability of the remainder of these Standard Terms and Conditions. If any provision is found to be invalid or unenforceable, that portion shall be modified to make it enforceable or shall be stricken and the remainder of these Standard Terms and Conditions shall enforced.
11. **GOVERNING LAW AND JURISDICTION.** Any controversy arising out of any quotation, the purchase order, the goods sold or delivered, repair or replacement thereof, or any services provided pursuant to any quotation or any purchase order, or these Standard Terms and Conditions shall be governed by the laws of the state of Tennessee without regard to any choice of law provisions and any cause of action related in any manner thereto shall be brought only in the state or federal courts of Shelby County, Tennessee.
12. **ABANDONED EQUIPMENT.** Hi-Speed requires that Buyer promptly pick up or provide shipment instructions for Buyer equipment or other Buyer property in Hi-Speed's possession. If equipment or other Buyer property is left with Hi-Speed and not picked up within six (6) months after Hi-Speed's final action related to the applicable property (e.g. evaluation, teardown, estimate, completion of services), Hi-Speed will consider such property abandoned and may dispose of it in accordance with applicable law. Buyer agrees to hold Hi-Speed harmless for any damage or claim for such abandoned property and acknowledges that Hi-Speed may discard or recycle it at Hi-Speed's sole and absolute discretion. Specifically, Hi-Speed may sell Buyer's abandoned property at a private or public sale and retain the proceeds to offset Hi-Speed's storage, inspection and servicing costs. For the avoidance of doubt, Hi-Speed reserves its statutory and other lawful liens for unpaid charges related to abandoned property.
13. **FORCE MAJEURE.** Neither party shall be responsible for any delay or failure in performance of any party of the quotation, purchase order or these Standard Terms and Conditions to the extent that such delays or failures are caused by fire, flood, earth quake, explosion, war, embargo, government requirement, civil or military authority, acts of God, or any other circumstances beyond its reasonable control and not involving any fault or negligence on the party affected ("Condition"). If any such Condition occurs, the party delayed or unable to perform shall promptly give written notice to the other party and, if such Condition remains at the end of thirty (30) days, the party affected by the other party's delay and inability to perform may elect to (i) terminate such order or part thereof, or (ii) suspend the order for the duration of the Condition, if the Buyer is the suspending party, buy elsewhere comparable material to be sold under the order and apply to any commitment the purchase price of such purchase, and resume performance of the order once the Condition ceases, with an option in the affected party to extend the period of this order up to the length of the time the Condition endures.
14. **NONWAIVER.** No course of dealing or failure of either party to strictly enforce any term, right, or condition of these Standard Terms and Conditions will be construed as a waiver of such term, right or condition. Any waiver by Hi-Speed will only be in writing and will waive no succeeding breach of a term, right or condition.
15. **ASSIGNMENT.** The rights and obligations of the parties shall neither be assigned nor delegated without the prior written consent of the other party. However, any party may assign or delegate its respective rights and obligations, in whole or in part, (i) to any subsidiary, (ii) pursuant to other financing, merger or reorganization or (iii) pursuant to any sale or transfer of substantially all of the assets of the assigning party. These Standard Terms and Conditions shall bind the heirs, successors and assigns of the parties hereto.
16. **NO INDIVIDUAL LIABILITY.** Notwithstanding any other agreement to the contrary, the Buyer agrees that in no event will the Buyer hold and HI-Speed owner, director, officer or employee personally liable for unintentional tortious conduct or conduct that constitutes the breach of any contract between HI-Speed and the Buyer, even if the HI-Speed owner, director, officer or employee is or could be construed to be a party to such contract.