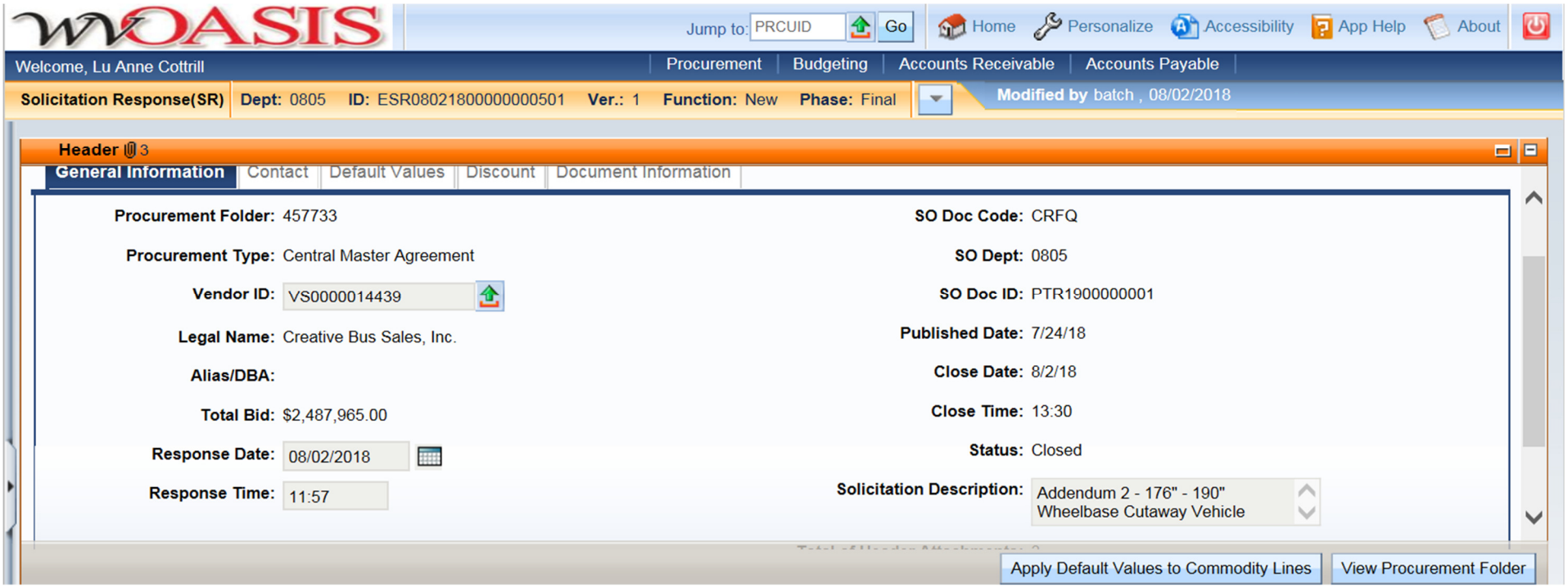
The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.


wvOASIS
Jump to: PRCUID Go
Home
Personalize
Accessibility
App Help
About
Welcome, Lu Anne Cottrill
Procurement
Budgeting
Accounts Receivable
Accounts Payable
Solicitation Response(SR) Dept: 0805 ID: ESR08021800000000501 Ver.: 1 Function: New Phase: Final
Modified by batch , 08/02/2018
Header 3
General Information
Contact
Default Values
Discount
Document Information
Procurement Folder: 457733
Procurement Type: Central Master Agreement
Vendor ID: VS0000014439
Legal Name: Creative Bus Sales, Inc.
Alias/DBA:
Total Bid: $2,487,965.00
Response Date: 08/02/2018
Response Time: 11:57
SO Doc Code: CRFQ
SO Dept: 0805
SO Doc ID: PTR1900000001
Published Date: 7/24/18
Close Date: 8/2/18
Close Time: 13:30
Status: Closed
Solicitation Description: Addendum 2 - 176" - 190" Wheelbase Cutaway Vehicle
Apply Default Values to Commodity Lines
View Procurement Folder

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 457733

Solicitation Description : Addendum 2 - 176" - 190" Wheelbase Cutaway Vehicle

Proc Type : Central Master Agreement

Date issued	Solicitation Closes	Solicitation Response	Version
	2018-08-02 13:30:00	SR 0805 ESR08021800000000501	1

VENDOR

VS0000014439

Creative Bus Sales, Inc.

Solicitation Number: CRFQ 0805 PTR1900000001

Total Bid : $2,487,965.00 **Response Date:** 2018-08-02 **Response Time:** 11:57:47

Comments:

FOR INFORMATION CONTACT THE BUYER

Michelle L Childers

(304) 558-2063
michelle.l.childers@wv.gov

Signature on File **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	176" - 190" Wheelbase Cutaway Vehicle	1.00000	EA	$2,487,965.000000	$2,487,965.00

Comm Code	Manufacturer	Specification	Model #
25101502			

Extended Description :

176" - 190" Wheelbase Cutaway Vehicle
****
Vendor should type or clearly print the information into the Exhibit A-Pricing Page to prevent errors in the evaluation. If Vendor is submitting bid online Vendor must submit Exhibit A -Pricing Page as attachment. TOTAL BID FOR EVALUATION is the amount Vendor is to enter into wvOASIS commodity line when submitting. Notwithstanding the

REQUIRED BID DOCUMENTATION CHECKLIST

Manufacturer: Glaval Model Year: 2019 Model: Universal

Mandatory Bid Forms – must be submitted with bid:

✓ Bid Form #1: Locations of Technical Service Representatives and Parts Distribution Centers

✓ Bid Form #2: Certification for Air & Water Pollution

✓ Bid Form #3: Disadvantaged Business Enterprise Vendors/Manufacturers Certification
The vendor shall also supply with bid FTA TVM DBE Goal Concurrence for the Current Fiscal Year Approval Letter.

✓ Bid Form #4: Buy America Certification Rolling Stock
Should the Vendor be declared responsive and low bid, pursuant to Pre-Award and Post Delivery Audit Requirements, the Division will require the Vendor to submit documentation (with the bid or prior to any award) that lists:

1) Component and sub-component parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs: and

2) The location of the final assembly point for the rolling stock, including a description of the activities that will take place at the final assembly point and the cost of final assembly.

✓ Bid Form #5: Federal Motor Vehicle Safety Standards Certification
Vendor shall also supply with bid a breakdown of FMVSS standards to be met with proposed vehicle.

✓ Bid Form #6: U.S. Comptroller's Debarment List Certification

✓ Bid Form #7: Certification of Primary Participant Regarding Debarment, Suspension, and Other Responsibility Matters

✓ Bid Form #8: Vendor's Certification of Understanding and Acceptance

✓ Bid Form #9: Certification of Restrictions on Lobbying

✓ Bid Form #10: Certification of Compliance with FTA's Vehicle Testing Requirements
A copy of the vehicle testing report (if available) shall be included with the bid.

✓ Exhibit A Pricing Page

Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation
36 — Vehicles

Proc Folder: 457733

Doc Description: 176" - 190" Wheelbase Cutaway Vehicle

Proc Type: Central Master Agreement

Date Issued	Solicitation Closes	Solicitation No	Version
2018-07-09	2018-07-24 13:30:00	CRFQ 0805 PTR1900000001	1

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

Creative Bus Sales, Inc.
28293 Clay Street,
Elkhart, IN 46517
877-326-2877

FOR INFORMATION CONTACT THE BUYER

Michelle L Childers
(304) 558-2063
michelle.l.childers@wv.gov

Signature X **FEIN #** 33-0388707 **DATE** 7/31/2018

All offers subject to all terms and conditions contained in this solicitation

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Creative Bus Sales, Inc.

Authorized Signature: _____ Date: 7/31/2018

State of Arizona

County of Maricopa, to-wit:

Taken, subscribed, and sworn to before me this 31st day of July, 2018.

My Commission expires April 25th, 2021.

AFFIX SEAL HERE

VICTORIA KING
Notary Public – Arizona
Maricopa County
My Comm. Expires Apr 25, 2021

NOTARY PUBLIC _____

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.:

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[x] Addendum No. 1	[ ] Addendum No. 6
[x] Addendum No. 2	[ ] Addendum No. 7
[ ] Addendum No. 3	[ ] Addendum No. 8
[ ] Addendum No. 4	[ ] Addendum No. 9
[ ] Addendum No. 5	[ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Creative Bus Sales, Inc.
Company

Authorized Signature

7/31/2018
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

Letter of Qualifications

Responder Information

Creative Bus Sales, Inc.
57475 County Road 3
Elkhart, IN 46517

Mike Wilson – General Manager
(877) 686-9448 – Phone
(574) 830-0063 – Fax
MikeW@creativebussales.com

Company History - Bidders Qualifications

Creative Bus Sales, Inc. began serving the needs of California transportation providers in 1980 under the name of Creative Transportation Services, Inc. (CTS). In 1980, CTS was sold and became Creative Bus Sales, Inc. Tony Matijevich subsequently purchased Creative in 1993. Prior to the purchase Tony was the President of ElDorado National, the largest manufacturer of small and mid-size buses in the nation. Under the current leadership and vision, Creative Bus Sales has become the largest volume small and mid-size bus dealership in the United States. Creative is unique in the bus industry as a dealer that focuses only on the needs of the commercial bus customer.

Creative Family of Companies Include:

Creative Bus Sales - Chino, California
Creative Bus Sales - Atlantic Beach, Florida
Creative Bus Sales - Phoenix, Arizona
Creative Bus Sales - Irving, Texas
Creative Collision and Paint-Chino, California
Green Alternative Systems- Chicago, IL
Creative Bus Sales- Tulsa, OK
Creative Bus Sales- Jacksonville, FL
Creative Bus Sales- Seattle, WA
El Dorado Bus Sales - San Mateo, California
Green Alternative Systems -Elkhart, Indiana
Creative Bus Sales -Albuquerque, New Mexico
Creative Fleet Leasing - Chino, California
Green Alternative Systems – Brooklyn, NY
Green Alternative Systems- Yorba, CA
Creative Bus Sales- Orlando, FL
Creative Bus Sales – Portland, OR

Creative Bus Sales was incorporated in the State of California in 1993 under the current ownership. Creative Bus Sales has had no judgments, litigation, licensing violations or other violations outstanding or resolved against it within the past five (5) years.

Background: Creative Bus Sales is the largest commercial bus dealership in the United States and sells, delivers and services hundreds of buses per year to agencies and companies in California and throughout the United States. Creative Bus Sales has held several State Contracts over the last 17 years and has delivered several thousand State contract vehicles during this time.

Experience (a partial listing of significant projects)

Significant Transit Projects Completed Over The Last 4-5 Years

OCTA	Over 950 Paratransit Buses
City of Los Angeles	Over 500 Paratransit Buses
Caltrans Division of Mass Transit	Over 2,000 Paratransit Buses
RTC Las Vegas	Over 400 Paratransit and Transit Buses
Access Services	Over 700 Paratransit Mini Vans
Dallas DART	398 Paratransit Buses
Montgomery County, MD.	93 Paratransit Buses

Notices should be sent c/o:

Mike Wilson – General Manager Creative Bus Sales, Inc. 57475 County Road 3, Elkhart, IN 46517
(877) 686-9448 – Phone (574) 830-0063 – Fax MikeW@creativebussales.com

Preparer: Marcus Hoffman, Procurement Manager for Creative Bus Sales, Inc. is the preparer of this proposal.

Flexible Scope: Creative Bus Sales, Inc. is committed to flexibility in the products and services offered in the contract upon request by the State.

Independent Pricing: Creative Bus Sales, Inc. certifies that in connection with this Contract the prices proposed have been arrived at without consultation, communication or agreement for the purpose of restricting competition.

Signer(s): Each person signing this proposal and/or addenda is the person responsible for or authorized to make decisions as to the prices quoted in the cost proposal and has not participated and will not participate in any action contrary to those stated above.

Key Personnel: Project Manager – Mike Wilson is the proposed Project Manager for this contract.

Organization and Key Staff Members Assigned to This Contract:
Creative Bus Sales, Inc. currently employs over 250 employees in all locations.

Tony Matijevich, President
Terry McCrea, Chief Financial Officer
Mike Wilson, General Manager
Marcus Hoffman, Procurement Manager
Justin Rougemont, Operations & Service Manager
Jason Hohalek, Corporate Warranty Administrator
Keith Grube, Parts & Warehouse Manager

Project Team: Mike Wilson, Project Manager will be responsible for the day-to-day maintenance of this contract. Some or all of the above mentioned personnel will be utilized as needed during the course of this project.

Consent: Creative Bus Sales, Inc. if awarded a contract will not assign any part of its interest in the agreement without prior consent of the State.

Acceptance of Terms: Creative Bus Sales, Inc. accepts the Contract Terms and Conditions.

RFP Response: Our understanding of the scope of work pertaining to this RFP solicitation and components includes but not limited to:

Customer Service Capabilities: Our service locations or are located within 5 hours of all recipients locations. Technical assistance is provided on the day of the phone call. We are exclusively able to direct factory personnel from any discipline including engineering, manufacturing, parts, service and management, in response to your need at the time. No delay in problem resolution due to out of state factory personnel availability is experienced. Swift and accurate resolutions to issues and needs are achieved through factory personnel directly reviewing issues, “first hand”, as they are presented.

Creative has excellent relations with all major component manufacturers. Creative’s service technicians and supervisory team are certified by John Deere, Cummins, A/C Carrier, Trans Air, Thermo King, Ricon, and Braun. Service technicians are graduates of the Automotive Technical College and Automotive Service Excellence (ASE) Master Technicians.

Creative’s parts service department is dedicated solely to the service and support of commercial and transit buses and does not service any other type of equipment, school buses or trucks. Such focus

insures an unmatched level of competency in the industry. Technical assistance can be provided immediately during business hours by contacting Creative Bus Sales service technicians.

List of Centers

One call to our Warranty Administration team will facilitate the best warranty option.
Creative Bus Sales is an authorized repair facility. They have the authority to make on the spot decisions regarding warranty repairs. As needed, local to the end user warranty repair facilities will be authorized to perform the required repair.

Spare Parts and Inventory Levels

A critical part of the project is a quick response time to service assistance and parts supply. Both of these items are provided from locations in Arizona, California, Florida, Indiana, and Texas. Once again, one call to our Parts network will facilitate the end users needs.

Creative Bus Sales provides parts supply and aftermarket support from five of our facilities. Over $10,000,000 worth of inventory is maintained at all times. Parts department personnel have over sixty years of experience in this field. Most parts can be shipped within twenty-four hours of order. Complete description of parts policy and procedures can be provided upon award.

Inspection procedures

Each vehicle will have a PDI (Pre-Delivery Inspection) performed before final delivery to the end customer. Any deficiency noted shall be repaired before delivery. All documents required under the contract shall be provided upon delivery or pickup. This pre-delivery inspection will be in addition to inspections performed by the manufacturer and/or line inspectors hired by the end user.

Cutoff Dates

CBS agrees to comply with this section. Model year cutoffs are well communicated by the OEM's and chassis dealers alike. We generally receive 60 – 90 days' notice and will promptly notify the agency.

Sincerely,

Marcus Hoffman
Procurement Manager
Creative Bus Sales, Inc.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Mike Wilson, Regional Sales Manager
(Name, Title)

(Printed Name and Title)
28293 Clay Street, Elkhart, IN 46517
(Address)
800-326-2877 / 574-830-0063
(Phone Number) / (Fax Number)
mikew@creativebussales.com
(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Creative Bus Sales, Inc.
(Company)

(Authorized Signature) (Representative Name, Title)

Marcus Hoffman, Procurement Manager
(Printed Name and Title of Authorized Representative)

7/31/2018
(Date)

602-437-2255 / 602-437-2758
(Phone Number) (Fax Number)

19. MISCELLANEOUS:

19.1 **No Substitutions:** Vendor shall supply only Vehicles as submitted in response to the Solicitation unless a contract modification is approved in accordance with the provisions contained in this Contract.

19.2 **Vendor Supply:** Vendor must carry sufficient inventory of the Contract Items being offered to fulfill its obligations under this Contract. By signing its bid, Vendor certifies that it can supply the Contract Items contained in its bid response.

19.3 **Contract Manager:** During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: Mike Wilson

Telephone Number: 800-326-2877

Fax Number: 574-830-0063

Email Address: mikew@creativebussales.com

20. NOTIFICATION OF FEDERAL PARTICIPATION

Federal funding for this project is being provided by the Federal Transit Administration through various CFDA grants for 80% of the project cost. CFDA grants will be specified after award.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 6/26/2017

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Beth Brocious	
Key Insurance & Benefits Services 726 Exchange Street Suite 900 Buffalo NY 14210	PHONE (A/C, No, Ext): (716)819-5500	FAX (A/C, No): (716)819-5140
	E-MAIL ADDRESS: Bethany.Brocious@key.insurance	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Creative Bus Sales, Inc. 14740 Ramona Avenue Chino CA 91710	INSURER A : Zurich American Insurance	16535
	INSURER B : National Union Fire Ins Co	19445
	INSURER C : Charter Oak Fire Insurance Co	25615
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** 17-18 CBS **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY [X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [ ] PRO-JECT [X] LOC	X	X	GLO 0381874-02	7/1/2017	7/1/2018	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A A	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [ ] HIRED AUTOS [ ] NON-OWNED AUTOS [X] Garage Liability	X	X	GP 0381803-02	7/1/2017	7/1/2018	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
B	[X] UMBRELLA LIAB [X] OCCUR [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [X] RETENTION $ 10,000			BE 066684100	7/1/2017	7/1/2018	EACH OCCURRENCE AGGREGATE	$ 20,000,000 $ 20,000,000
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [N] (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	X	WC 0380954 02	7/1/2017	7/1/2018	[X] WC STATU-TORY LIMITS [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000
C	Dealers Inventory			QT-630-6J072709-TIL-17	7/1/2017	7/1/2018		66,355,450
A	Garagekeepers Legal Liab			GP 0381803-02	7/1/2017	7/1/2018		1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Certificate holder is listed as a primary additional insured with respect to the above liability limit as required by written contract. A waiver of subrogation is included as required by written contract. Per location aggregate applies when required by contract.

CERTIFICATE HOLDER

Proof of Insurance

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

M Bonetto/CGEIGE

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BID FORM #1

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

Location(s) of Technical Service Representative(s) closest or in the State of West Virginia

Name: Creative Bus Sales - Indiana

Address: 28293 Clay Street, Elkhart, IN 46517

Contact: Mike Wilson or Curt Smith

Telephone: 800-326-2877

Name: Creative Bus Sales - Georgia

Address: 1525 Willingham Drive, Atlanta, GA 30344

Contact: Carl Henderson - Eastern Service Manager

Telephone: 770-422-8920

Location(s) of Parts Distribution Center(s) closest or in the State of West Virginia

Name: Creative Bus Sales - Indiana

Address: 28293 Clay Street, Elkhart, IN 46517

Telephone: 800-326-2877

Name: Creative Bus Sales - Parts Distribution Warehouse

Address: 3832 E. Roeser, Phoenix, AZ 85040

Telephone: 888-993-5040

BID FORM #2

CERTIFICATION FOR AIR & WATER POLLUTION
MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

The Vendor certifies that the vehicles proposed:

ARE _x_ in compliance with the regulations in 40 CFR Part 85, 40 CFR Part 86, 40 CFR Part 600, Clean Water Act and the air/water pollution criteria established by the Environmental Protection Agency of the United States Government.

ARE NOT _____ in compliance with the regulations in 40 CFR Part 85, 40 CFR Part 86, 40 CFR Part 600, Clean Water Act and the air/water pollution criteria established by the Environmental Protection Agency of the United States Government.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

BID FORM #3

DISADVANTAGED BUSINESS ENTERPRISE VENDORS/ MANUFACTURERS CERTIFICATION

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

(Check appropriate statement)

____ The Vendor, if a transit vehicle manufacturer, hereby certifies that it has complied with the requirements of 49 CFR Section 26.49 by submitting an annual DBE goal to the Federal Transit Administration (FTA). The goal has either been approved or not disapproved by FTA.

__x__ The Vendor, if a non-manufacturing supplier, hereby certifies that the manufacturer of the transit vehicle to be supplied has complied with the above-referenced requirement of 49 CFR Section 26.49.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

U.S. Department
Of Transportation
Federal Transit Administration

Headquarters

East Building, 5th Floor – TCR
1200 New Jersey Avenue, SE
Washington, DC 20590

September 22, 2017

Donall Hasty
DBE Liaison Officer
Glaval Bus
2367 Century Drive
Goshen, IN 46525

Re: TVM DBE Goal Concurrence/Certification Letter – Fiscal Year 2018

Dear Mr. Hasty:

This letter is to inform you that the Federal Transit Administration's (FTA) Office of Civil Rights has received Glaval Bus's Disadvantaged Business Enterprise (DBE) goal and methodology for FY 2018 for the period of October 1, 2017–September 30, 2018. This goal submission is required by the U.S. Department of Transportation's DBE regulations at 49 CFR Part 26 and must be implemented in good faith.

We have reviewed your FY 2018 DBE goal and determined that it is compliant with DOT's DBE regulations. You are eligible to bid on FTA-funded transit contracts. This letter or a copy of the TVM listing on FTA's website may be used to demonstrate your compliance with DBE requirements when bidding on federally funded vehicle procurements.

FTA reserves the right to remove/suspend this concurrence if your DBE program or FY 2018 DBE goal is not implemented in good faith. In accordance with this good faith requirement, you must submit your DBE Uniform Report to FTA by December 1, 2017. This report should reflect all FTA-funded contracting activity for the second period of FY 2017 (i.e., from April 1 to September 30).

Please also be mindful that your FY 2019 DBE goal methodology must be submitted to FTA by August 1, 2018. Any updates to the program plan must be submitted to FTA as they occur. Thank you for your cooperation. If you have any questions regarding this approval, please contact the FTA DBE Team via e-mail at *FTATVMSubmissions@dot.gov*.

Sincerely,

John Day
Program Manager for Policy
and Technical Assistance
Office of Civil Rights

Eligible Transit Vehicle Manufacturers

DBE regulations require FTA recipients to report transit vehicle procurement awards (49 CFR 26.49). Since November 2014, FTA grantees have been required to submit, within 30 days of making an award, the name of the successful bidder and the total dollar value of the contract. Only eligible TVMs may bid on FTA-assisted transit vehicle procurements. Transit vehicle manufacturers that have submitted a goal methodology to FTA that has been approved, or has not been disapproved, at the time of solicitation are eligible to bid (49 CFR 26.49(a)(1)). The following is a list of eligible TVMs:

Transit Vehicle Manufacturer	Address	DBE Goal %	DBE Liaison Officer/ Email
Alexander Dennis	31566 Railroad Canyon Road Suite 342 Canyon Lake, CA	3.00%	Judy Lovitt
Alstom Transport	1 Transit Drive Hornell, NY	7.55%	Michelle Studer
ARBOC	51165 Greenfield Parkway Middlebury, IN	1.00%	Debbie Baker
Blue Bird	402 Blue Bird Blvd. P.O. Box 937 Fort Valley, GA	1.00%	Linda Belflower
Bombardier	1101 Parent Street Saint-Bruno Quebec, Canada	8.50%	Sophie Moore
Braun	631 W 11th Street Winamac, IN	5.00%	Ken Morgel

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Brookville Equipment Corp.	175 Evans Street Brookville, PA	4.40%	Ron Rodgers
Brown Industries, LLC	807 East 29th Street Lawrence, KS	2.06%	Dane Johnson
BYD	1800 South Figueroa Street Los Angeles, CA	7.00%	Greg Davis
CAF USA	1401 K Street, NW Washington, DC	3.51%	Tonia Crosby
Champion Bus/General Coach America	331 Graham Road Imlay City, MI	1.00%	Brad Lupo
Coach & Equipment Manufacturing	130 Horizon Park Drive Penn Yan, NY	1.26%	Gina Zito
Collins Bus	415 W. 6th Ave.	0.48%	Jeff Eriksen
Complete Coach Works	1863 Service Court Riverside, CA	1.00%	Michael Perez
CRRC MA Corporation	100 Summer Street, Suite 1603 Boston, MA	7.25%	Tina Andrews
CRRC Sifang America	300 North LaSalle Street, Suite 2240 Chicago, IL	1.90%	James Kozicki
Diamond Aquisition d/b/a Diamond Coach	2300 W. 4th Street Oswego, KS	1.10%	Kate Strickland
ElDorado National	9670 Galena Street Riverside, CA 1655 Wall Street Salina, KS	3.43%	Jake Calvo

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Fenton Mobility	1209 E. Second Street Jamestown, NY	0.105%	Mary Gabalski
Forest River: Elkhart Coach, Glaval Bus, Starcraft/StarTrans Bus	914 County Road 1 Elkhart, IN	Elkhart: 0.75%; Glaval: 0.71%; Starcraft: 0.82%	Donall Hasty
FR Conversions	1231 Tech Court Westminster, MD	0.20%	Paul Kluth
Gillig	25800 Clawiter Road Hayward, CA	2.70%	Chris Turner
Gomaco	P.O. Box 151 Ida Grove, IA	1.27%	Troy Kruse
Grand West Transportation International Ltd.	3168 262nd Street Aldergrove BC, Canada	1.16%	Ryan Lindgren
Green Power	31-7000 Merrill Ave. Chino, CA	6.27%	Fraser Atkinson
Higher Power	11 Sunny Slope Terrace Yonkers, NY	3.06%	Michael Liebler
*Hitachi Rail	Via Cilliegiole 110/B 51100 Pistoria, Italy	8.00%	William E. Doyle Jr.
*Hitachi Rail USA	101 The Embarcadero, Suite 210 San Francisco, CA	8.00%	William E. Doyle Jr.
Hometown Trolley/Double K	701 North Rail Road Ave. Crandon, WI	4.00%	Talia Walerko
Inekon	350 SE 2nd Street, Suite 730	2.03%	Milo Srkal

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	Fort Lauderdale, FL		
Kawasaki	29 Wells Ave. Building #4 Yonkers, NY	6.92%	Tadashi Doi
Kiepe Electric Inc.	395 Curie Dr, Alpharetta, GA	2.14%	Noel Dsa
Kinkisharyo International	300 North Continental Boulevard, Suite 300 El Segundo, CA	2.30%	Melissa Rath
Lone Star	12953 Highway 63 West Tyler, TX	3.00%	Norma Niderhofer
Metro Worldwide, LLC	3101 Willow Creek Court, P.O. Box 147 Clear Lake, IA	1.28%	Scott Loges
Midway Specialty Vehicles	2940 Dexter Drive Elkhart, IN	6.73%	Mike R. Violi
Midwest Bus Corporation	1940 West Stewart Street Owosso, MI	0.70%	Julita A. Velasco
Mitsubishi Heavy Industries America, Inc.	630 Fifth Avenue, Suite 2650 New York, NY	2.00%	Michael Ang
Mobility Transportation	42000 Koppernick Road, #A3 Canton, MI	2.00%	Dave Brown
MotivePower, Inc.	4600 Apple Street Boise, ID	2.00%	Zach Maulik
Motor Coach Industries	200 E. Oakton Street Des Plaines, IL	4.90%	Pablo Batista
National Van Builders	80 Pine Street Attleboro, MA	5.00%	Glen Perlman

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New England Wheels	33 Manning Road Billerica, MA	4.00%	Gerald Dann
New Flyer	711 Kernaghan Ave. Winnipeg, Manitoba	4.20%	Darrin Smith
Nor-Cal Vans	1300 Nord Ave., Suite 125 Chico, CA	3.00%	Amanda McTavish
Nova Bus/Prevost Car	260 Banker Road Plattsburgh, NY	3.00%	Karen Honeysett
Prime-Time Specialty Vehicles, Inc	56616 Elk Park Drive Elkhart, IN	2.00%	Steve Rand
Progress Rail Locomotive	1600 Progress Drive Albertville, AL	1.50%	Susan Lash
Proterra	1 Whitlee Court Greenville, SC	3.10%	Eric McCarthy
*RELCO Locomotive Inc.	P.O. Box 218 Albia, IA	3.80%	Douglas Bachman
Siemens	7464 French Road Sacramento, CA	5.69%	Michelle Picard
Stadler US	231 North Ave. W. #112 Westfield, NJ	3.10%	Aaron Wilcoxon
Sumitomo	2340 S. Arlington Heights Road, Suite 605 Arlington Heights, IL	5.17%	Hideyaki Ninomiya
Talgo	3533 North 27th Street Milwaukee, WI	2.61%	Ferran Canals
Thomas Built Buses	1408 Courtesy Road High Point, NC	2.59%	Kenneth Hedgecock

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TransitWorks, LLC	1090 W. Wilbeth Road Akron, OH	1.20%	Cindy Poinar
Turtle Top	67819 State Road 15 New Paris, IN	0.85%	Matthew Gaff
Waldoch Crafts Inc.	13821 Lake Drive NE Forest Lake, MN	2.30%	Scot Maki

*Goal methodology has been submitted and is pending review by FTA. The TVM is eligible to bid on FTA-assisted procurements.

Updated: Friday, January 12, 2018

Related Links

- Transit Vehicle Manufacturers (TVMs)
- Transit Vehicle Award Reporting Form

Contact Us

Office of Civil Rights
Federal Transit Administration
1200 New Jersey Avenue, SE
Washington, DC 20590
United States

Phone: 888-446-4511

Business Hours:
8:30am-5:00pm ET, M-F

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BID FORM #4

BUY AMERICA CERTIFICATION
ROLLING STOCK
MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

Certificate of Compliance

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. § 5323(j), as amended and the applicable regulations of 49 CFR 661.12:

7/31/2018
Date

Authorized Signature

Creative Bus Sales, Inc.
Company Name

Marcus Hoffman
Name

Procurement Manager
Title

Certificate for Non-Compliance

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. § 5323(j), as amended, but may qualify for an exception to the requirement consistent and the applicable regulations in 49 CFR 661.7.

Date

Authorized Signature

Company Name

Name

Title

BID FORM #5

FEDERAL MOTOR VEHICLE SAFETY STANDARDS CERTIFICATION

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

The vendor hereby certifies that it shall submit, as required by Title 49 of the CFR, Part 663 - Subpart D, it's self-certification information stating that the vehicle(s) will comply with the relevant Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 of the Code of Federal Regulations, Part 571.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

2018

C/FMVSS Compliance Summary

Glaval Bus
A Division Of Forest River, Inc.

This document gives a brief summary of how Glaval Bus meets all applicable federal regulations.
NOTICE: All required testing is on file and available upon request.

Regulation	Regulation Description	Compliance Summary
C/FMVSS 101	Controls and displays	Compliance deferred to chassis manufacturer.
C/FMVSS 102	Transmission shift lever sequence, starter interlock & transmission braking effect	Compliance deferred to chassis manufacturer.
C/FMVSS 103	Windshield defrosting & defogging systems	Compliance deferred to chassis manufacturer.
C/FMVSS 104	Windshield wiping & washing systems	Compliance deferred to chassis manufacturer.
C/FMVSS 105	Hydraulic brake systems	Stretched units meet test requirements, for non-stretched units compliance deferred to chassis manufacturer.
C/FMVSS 106	Brake hoses	Stretched units use OEM compliant hoses, for non-stretched compliance deferred to chassis manufacturer.
C/FMVSS 108	Lamps, reflective devices & associated equipment	All lighting and reflective devices are present and installed to this standard. OEM lighting compliance deferred to chassis manufacturer.
CMVSS 108.1	Alternative requirements for headlights	Glaval does not alter any headlight component. Headlights meet regulation by manufacturer.
C/FMVSS 111	Rear view mirrors	Glaval installs aftermarket compliant mirrors. OEM mirror compliance deferred to chassis manufacturer.
C/FMVSS 113	Hood latch systems	Compliance deferred to chassis manufacturer.
C/FMVSS 114	Theft protection	Compliance deferred to chassis manufacturer.
C/FMVSS 115	Vehicle identification number	Compliance deferred to chassis manufacturer.
C/FMVSS 116	Hydraulic brake fluids	Compliance deferred to chassis manufacturer.
C/FMVSS 118	Power operated window, partition, and roof panel systems (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 120	Tire selection and rim for motor vehicles with a GVWR of 4,536kg/10,000 lbs. or more	Compliance deferred to chassis manufacturer. Tire/weight label also applied by Glaval.
C/FMVSS 121	Air brake systems	Stretched units use OEM compliant parts, for non-stretched compliance deferred to chassis manufacturer.
C/FMVSS 124	Accelerator control systems	Compliance deferred to chassis manufacturer.
C/FMVSS 125	Warning devices	All vehicles are shipped with a compliant triangle safety kit.
C/FMVSS 201	Occupant protection in interior impact (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 202	Head restraints (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 203	Impact protection for the driver from the steering control system (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 204	Steering control rearward displacement	Compliance deferred to chassis manufacturer.
C/FMVSS 205	Glazing materials	Cab compliance deferred to chassis manufacturer, additional glazing materials meet standard.
C/FMVSS 206	Door locks and door retention devices (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 207	Seating system	Glaval exceeds testing and standard requirements; cab seats meet OEM testing requirements.
C/FMVSS 208	Occupant crash protection	Glaval follows OEM guidelines; compliance deferred to chassis manufacturer.
C/FMVSS 209	Seat belt assemblies	Glaval follows OEM guidelines; compliance deferred to chassis manufacturer. Added belts meet 209.
C/FMVSS 210	Seat belt assembly anchorage	Glaval exceeds testing and standard requirements; cab seats meet OEM testing requirements.
CMVSS 210.1	User-ready tether anchorages for restraint systems and booster seats (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
CMVSS 210.2	Lower universal anchorage systems for restraint systems and booster cushions (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 212	Windshield mounting (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 213	Child restraint systems	Glaval does offer integrated child seats that have been tested to meet 213.
C/FMVSS 216	Roof crush resistance (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 217	Bus window retention and release	Glaval exceeds testing and standard requirements.
C/FMVSS 219	Windshield zone intrusion (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.

2018

C/FMVSS Compliance Summary

Glaval Bus
A Division Of Forest River, Inc.

This document gives a brief summary of how Glaval Bus meets all applicable federal regulations.
NOTICE: All required testing is on file and available upon request.

Regulation	Regulation Description	Compliance Summary
C/FMVSS 220	School bus rollover testing	Glaval offers units built to this standard (when requested) which exceeds testing requirements.
C/FMVSS 221	School bus body joint strength	Glaval exceeds testing requirements to meet this standard. ***NOTE: Must use FRP skin option.***
FMVSS 225	Child restraint anchorage systems (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 301	Fuel system integrity (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 302	Flammability of interior materials	Glaval exceeds testing requirements to meet this standard, cab materials defer to chassis manufacturer.
C/FMVSS 303	Fuel system integrity of compressed natural gas systems (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 304	Compressed natural gas fuel container integrity (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 305	Electrolyte spillage and electrical shock protection (under 10,000 lbs.)	Glaval does not build on units under 10K, regulation does not apply.
C/FMVSS 403	Platform lift system for motor vehicles	Compliance deferred to lift manufacturer.
C/FMVSS 404	Platform lift installation on motor vehicles	Glaval installs lifts according to lift manufacturer's instructions for compliance to this standard.
CMVSS 1106	Noise emissions	Glaval follows OEM guidelines and has additional testing performed to meet this standard.

BID FORM #6
U.S. Comptroller's Debarment List Certification

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

Creative Bus Sales, Inc. hereby certifies that it

_____ **IS or**

__x__ **IS NOT** (specify one) included on the. U.S. GSA's debarment and suspension information available at https://www.sam.gov.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

BID FORM #7

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

CERTIFICATION OF PRIMARY PARTICIPANT REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The Primary Participant (applicant for an FTA grant or cooperative agreement, or potential contractor for a major third party contract),
Creative Bus Sales, Inc. (COMPANY NAME) certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

2. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and

4. Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

If the primary participant (applicant for an FTA grant, or cooperative agreement, or potential third party contractor) is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.)

THE PRIMARY PARTICIPANT (APPLICANT FOR AN FTA GRANT OR COOPERATIVE AGREEMENT, OR POTENTIAL CONTRACTOR FOR A MAJOR THIRD PARTY CONTRACT),
Creative Bus Sales, Inc., CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

Procurement Manager
Signature and Title of Authorized Official

BID FORM #8

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

VENDOR'S CERTIFICATION OF UNDERSTANDING AND ACCEPTANCE

The Vendor hereby certifies that all Technical Specifications and Contract Terms and Conditions have been carefully reviewed, are fully understood and shall be adhered to in performance and completion of any contract resulting from this bid.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

SPECIFICATION COMPLIANCE

NOTE: Please check if what is offered is not in exact compliance with specifications. **Any discrepancies must be listed as an attachment to the bid proposal. Exact dimensions and/or descriptions must be provided as a part of the Vendor's bid proposal when submitted.**

✓ Bid proposal submitted meets and/or exceeds all specification requirements.

____ Bid proposal submitted contains deviations from specification requirements. Detailed descriptions of these deviations have been provided with this bid proposal.

BID FORM #9

MANDATORY BID FORM – MUST BE SUBMITTED WITH BID

CERTIFICATION OF RESTRICTIONS ON LOBBYING

The undersigned (Vendor, Contractor) certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influence or attempt to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress regarding the award of a Federal grant, loan (including a line of credit), cooperative agreement, loan guarantee, or loan insurance, or the extension, continuation, renewal, amendment, or modification of any Federal grant, loan (including a line of credit), cooperative agreement, loan guarantee, or loan insurance.

2. If any funds other than Federal appropriated funds have been or will be paid to any person to influence or attempt to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or any employee of a Member of Congress in connection with any application for a Federal grant, loan (including a line of credit), cooperative agreement, loan guarantee, or loan insurance, the undersigned assures that it will complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," Rev. 7-97; and

3. The undersigned understands that the language of this certification shall be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, sub agreements. and contracts under grants, loans (including a line of credit), cooperative agreements, loan guarantees, and loan insurance.

Undersigned understands that this certification is a material representation of fact upon which reliance is placed by the Federal government and that submission of this certification is a prerequisite for providing a Federal grant, loan (including a line of credit), cooperative agreement, loan guarantee, or loan insurance for a transaction covered by 31 U.S.C. 1352. The undersigned also understands that any person who fails to file a required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The (Vendor, Contractor) Creative Bus Sales, Inc., certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the (Vendor, Contractor understands and agrees that the provisions of 31 U.S.C. §§ 3801, et seq., apply to this certification and disclosure.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

BID FORM #10

CERTIFICATION OF COMPLIANCE WITH FTA'S BUS TESTING REQUIREMENTS

The undersigned (Vendor/Manufacturer) certifies that the vehicle offered in this procurement complies with 49 U.S.C. 5318, as amended by MAP-21, and FTA regulations, "Bus Testing," 49 CFR Part 665.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with Federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

7/31/2018
Date

Authorized Signature

Procurement Manager
Title

Creative Bus Sales, Inc.
Company Name

STURAA TEST

5 YEAR

150,000 MILE BUS

from

GLAVAL CORPORATION

MODEL UNIVERSAL

AUGUST 1999

PTI-BT-R9910-13-99

PENNSTATE

1855

The Pennsylvania Transportation Institute

201 Research Office Building (814) 865-1891
The Pennsylvania State University
University Park, PA 16802

Bus Testing and Research Center

6th Avenue and 45th Street (814) 949-7944
Altoona, PA 16602

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EXECUTIVE SUMMARY

Glaval Bus submitted a model Universal, diesel powered 26 seat/25-foot bus, for a 5 year/150,000 mile STURAA test. The odometer reading at the time of delivery was 493.0 miles. Testing started on May 11, 1999, and was completed on July 19. 1999. The Check-In section of the report provides a description of the bus and specifies its major components.

The primary part of the test program is the Structural Durability Test, which also provides the information for the Maintainability and Reliability results. The Structural Durability Test started on May 20, 1999 and was completed on July 9, 1999.

The interior of the bus is configured with seating for 26 passengers including the driver. Additionally, free floor space will accommodate 10 standing passengers resulting in a potential load of 36 persons. At 150 lbs per person, this load results in a total vehicle weight of 15,340 lbs and exceeds the GAWR of the rear axle (9,450 lbs). In order to avoid exceeding the axle weight ratings, ballast simulating all 10 standing passengers (1,500 lbs) and 1 rear seated passenger (150 lbs) was removed. Elimination of this ballast resulted in an adjusted gross vehicle weight of 13,730 lbs. The adjusted weight was used for both the GVW and middle SLW segments of the Structural Durability Test. The final segment of the test was performed at a CW of 10,110 lbs. Durability driving resulted in several failures that required unscheduled maintenance. A description of failures, and a complete and detailed listing of scheduled and unscheduled maintenance, is provided in the Maintainability section of this report.

The components covered in Section 1.3 (Repair and/or Replacement of Selected Subsystems) along with all other components encountered during testing were found to be readily accessible and no restrictions were noted.

The Reliability Section compiles failures that occurred during structural durability testing. Breakdowns are classified according to subsystems. The data in this section are arranged so that those subsystems with more frequent problems are apparent. Also the problems are listed by class as defined in Section 2. The test bus encountered no Class 1 or Class 2 failures. Of the eight reported failures, seven were Class 3 and one was Class 4.

The Safety Test, a double-lane change maneuver was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 18.55 seconds.

The Shakedown Test produced a maximum final loaded deflection of 0.069 inches under a distributed static load of 13,500 lbs. The test resulted in essentially no permanent deflection of the structure. The Distortion Test was completed with all subsystems, doors and escape mechanism operating properly. No water leakage was observed during the test. Due to the lack of tow eyes or tow hooks the Static Towing Test was not performed. The Dynamic Towing Test was performed by means of a front lift tow. The towing interface was accomplished by chaining to the front axle. The bus was towed without incident and no damage resulted from the test. The manufacturer does not recommend towing the bus from the rear, therefore a rear test was not performed. The Jacking and Hoisting Tests were performed without incident. The bus was found to be stable on the jack stands and the minimum jacking clearance, measured with a tire deflated, was 8.5 inches.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 6.64 mpg, 7.03 mpg, and 11.76 mpg respectively; with an overall average of 7.72 mpg.

A series of Interior and Exterior Noise Tests was performed. This data is listed in Section 7.1 and 7.2 respectively.

ABBREVIATIONS

ABTC	-	Altoona Bus Test Center
A/C	-	air conditioner
ADB	-	advance design bus
ATA-MC	-	The Maintenance Council of the American Trucking Association
CBD	-	central business district
CW	-	curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	-	decibels with reference to 0.0002 microbar as measured on the "A" scale
DIR	-	test director
DR	-	bus driver
EPA	-	Environmental Protection Agency
FFS	-	free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
GVL	-	gross vehicle load (150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
GVW	-	gross vehicle weight (curb weight plus gross vehicle load)
GVWR	-	gross vehicle weight rating
MECH	-	bus mechanic
mpg	-	miles per gallon
mph	-	miles per hour
PM	-	Preventive maintenance
PTI	-	Pennsylvania Transportation Institute
rpm	-	revolutions per minute
SAE	-	Society of Automotive Engineers
SCH	-	test scheduler
SEC	-	secretary
SLW	-	seated load weight (curb weight plus 150 lb for every designed passenger seating position and for the driver)
STURAA	-	Surface Transportation and Uniform Relocation Assistance Act
TD	-	test driver
TECH	-	test technician
TM	-	track manager
TP	-	test personnel

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the NBM, assign a NBM number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consists of assigning a NBM test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer must certify that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus has a front door located to the rear of the front axle. (Note; this test bus was not equipped with a handicap device). The engine type is a diesel fueled Ford Power Stroke 7.3L. The transmission is a Ford E 40 D.

The measured curb weight is 4,140 lb for the front axle and 5,970 lb for the rear axle. These combined weights provide a total measured curb weight of 10,110 lb. The interior of the bus is configured with seating for 26 passengers including the driver. Additionally, free floor space will accommodate 10 standing passengers resulting in a potential load of 36 persons. At 150 lbs per person, this load results in a total vehicle weight of 15,340 lbs and exceeds the GAWR of the rear axle (9,450 lbs). This value was used for all static tests. In order to avoid exceeding the axle weight ratings, ballast simulating all 10 standing passengers (1,500 lbs) and 1 rear seated passenger (150 lb) was removed. Elimination of this ballast resulted in an adjusted gross vehicle weight of 13,730 lbs. The adjusted weight was used for both the GVW and SLW segments of the Structural Durability Test.

VEHICLE DATA FORM

Bus Number: 9910	Arrival Date: 5-11-99
Bus Manufacturer: Glaval Bus Ind.	Vehicle Identification Number (VIN): 1FDWE40F0XHA40528
Model Number: Universal	Date: 5-11-99
Personnel: S.C.	

WEIGHT: *Values in the parentheses indicate the adjusted weights necessary to avoid exceeding the GAWR. These values were used for all dynamic testing.

Individual Wheel Reactions:

Weights (lb)	Front Axle		Middle Axle		Rear Axle	
	Right	Left	Right	Left	Right	Left
CW	2,000	2,140	N/A	N/A	3,120	2,850
SLW	2,080	2,290	N/A	N/A	4,860	4,500
GVW	(2,080) 2,050	(2,290) 2,310	N/A	N/A	(4,860) 5,690	(4,500) 5,290

Total Weight Details:

Weight (lb)	CW	SLW	GVW	GAWR
Front Axle	4,140	4,370	(4,370) 4,360	4,600
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	5,970	9,360	(9,360) 10,980	9,450
Total	10,110	13,730	(13,730) 15,340	GVWR: 14,000

Dimensions:

Length (ft/in)	25.0 / 4.3
Width (in)	96.0
Height (in)	111.0
Front Overhang (in)	30.3
Rear Overhang (in)	88.0
Wheel Base (in)	186.0
Wheel Track (in)	Front: 67.0
	Rear: 77.8

Bus Number: 9910	Date: 5-11-99

CLEARANCES:

Lowest Point Outside Front Axle	Location: Steering stabilizer Clearance(in): 11.1
Lowest Point Outside Rear Axle	Location: Fuel tank support Clearance(in): 13.5
Lowest Point between Axles	Location: Entry door Clearance(in): 8.7
Ground Clearance at the center (in)	13.7
Front Approach Angle (deg)	24.6
Rear Approach Angle (deg)	8.8
Ramp Clearance Angle (deg)	13.5
Aisle Width (in)	14.0
Inside Standing Height at Center Aisle (ft)	76.8

BODY DETAILS:

Body Structural Type	Integral		
Frame Material	Steel		
Body Material	Steel and fiberglass		
Floor Material	Plywood		
Roof Material	Steel and fiberglass		
Windows Type	☐ Fixed	☒ Movable	
Window Mfg./Model No.	Safety Inc. / M282		
Number of Doors	1 Front	0 Rear	
Mfr. / Model No.	Glaval / 32-manual		
Dimension of Each Door (in)	Front-30.5 x 83.5	Rear- N/A	
Passenger Seat Type	☐ Cantilever	☒ Pedestal	☐ Other
Mfr. / Model No.	Freedman Seating Co. / NA		
Driver Seat Type	☐ Air	☐ Spring	☒ Other (Cushion)
Mfr. / Model No.	Freedman / BFDf1		

Number of Seats (including Driver)	26

Bus Number: 9910	Date: 5-11-99

BODY DETAILS (Contd..)

Free Floor Space (ft^2)	15.0		
Height of Each Step at Normal Position (in)	Front 1. 11.1 2. 7.8 3. 7.9 4. N/A		
	Middle 1. N/A 2. N/A 3. N/A 4. N/A		
	Rear 1. N/A 2. N/A 3. N/A 4. N/A		
Step Elevation Change - Kneeling (in)	N/A		

ENGINE

Type	☒ C.I.	☐ Alternate Fuel	
	☐ S.I.	☐ Other (explain)	
Mfr. / Model No.	Ford Power Stroke / 7.3L		
Location	☒ Front	☐ Rear	☐ Other (explain)
Fuel Type	☐ Gasoline	☐ CNG	☐ Methanol
	☒ Diesel	☐ LNG	☐ Other (explain)
Fuel Tank Capacity (indicate units)	35.0 gals.		
Fuel Induction Type	☒ Injected	☐ Carburetion	
Fuel Injector Mfr. / Model No.	Ford Power Stroke / 7.3L		
Carburetor Mfr. / Model No.	N/A		
Fuel Pump Mfr. / Model No.	Ford Power Stroke / 7.3L		
Alternator (Generator) Mfr. / Model No.	Penntex Ind. / PX-520		
Maximum Rated Output (Volts / Amps)	14 / 200		
Air Compressor Mfr. / Model No.	N/A		
Maximum Capacity (ft^3 / min)	N/A		
Starter Type	☒ Electrical	☐ Pneumatic	☐ Other (explain)

Starter Mfr. / Model No.	Ford / Ford-Motorcraft		
Bus Number: 9910	Date: 5-11-99		

TRANSMISSION

Transmission Type	☐ Manual	☐ Automatic	
Mfr. / Model No.	Ford / E40D		
Control Type	☒ Mechanical	☐ Electrical	☐ Other (explain)
Torque Convertor Mfr. / Model No.	Ford / E40D		
Integral Retarder Mfr. / Model No.	N/A		

SUSPENSION

Number of Axles	2		
Front Axle Type	☒ Independent	☐ Beam Axle	
Mfr. / Model No.	Ford / Twin I-Beam		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☒ Spring	☐ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Motorcraft / CK1432F		
Middle Axle Type	☐ Independent	☐ Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	☐ Air	☐ Spring	☐ Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	☐ Independent	☒ Beam Axle	
Mfr. / Model No.	Ford / 9450		
Axle Ratio (if driven)	4.10		
Suspension Type	☐ Air	☒ Spring	☐ Other (explain)
No. of Shock Absorbers	2		

Mfr. / Model No.	Motorcraft / CK08R2G

Bus Number: 9910	Date: 5-11-99

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Accuride / NA
	Tire Mfr./ Model No.	Firestone LT225/75R16
Rear	Wheel Mfr./ Model No.	Accuride / NA
	Tire Mfr./ Model No.	Firestone LT225/75R16

BRAKES

Front Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	Kelsey Hayes / KH12795101		
Middle Axle Brakes Type	☐ Cam	☐ Disc	☐ Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	☐ Cam	☒ Disc	☐ Other (explain)
Mfr. / Model No.	Kelsey Hayes / KH12068401		
Retarder Type	N/A		
Mfr. / Model No.	N/A		

HVAC

Heating System Type	☐ Air	☒ Water	☐ Other
Capacity (Btu/hr)	65,000		
Mfr. / Model No.	Pro Air / 65K		
Air Conditioner	☒ Yes	☐ No	
Location	Front-dash Rear-roof mount		
Capacity (Btu/hr)	67,000		
A/C Compressor Mfr. / Model No.	Carrier / CM-3		

STEERING

Steering Gear Box Type	Hydraulic gear
Mfr. / Model No.	Ford / Power
Steering Wheel Diameter	15.4

Number of turns (lock to lock)	4

Bus Number: 9910	Date: 5-11-99

OTHERS

Wheel Chair Ramps	Location: N/A	Type: N/A
Wheel Chair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	N/A	
Emergency Exit	Location: Windows Doors	Number: 3 1

CAPACITIES

Fuel Tank Capacity (gallons)	35.0
Engine Crankcase Capacity (gallons)	3.5
Transmission Capacity (gallons)	4.0
Differential Capacity (gallons)	0.5
Cooling System Capacity (gallons)	7.5
Power Steering Fluid Capacity (Quarts)	1.5

VEHICLE DATA FORM

Bus Number: 9910	Date: 5-11-99

List all spare parts, tools and manuals delivered with the bus.

Part Number	Description	Qty.
N/A	N/A	N/A

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 9910	Date: 5-11-99

Subsystem	Checked	Comments
Air Conditioning Heating and Ventilation	✓	
Body and Sheet Metal	✓	Left side rear view mirror damaged when received.
Frame	✓	
Steering	✓	
Suspension	✓	
Interior/Seating	✓	
Axles	✓	
Brakes	✓	
Tires/Wheels	✓	
Exhaust	✓	
Fuel System	✓	
Power Plant	✓	
Accessories	✓	
Lift System	N/A	
Interior Fasteners	✓	
Batteries	✓	

CHECK - IN

GLAVAL'S MODEL
UNIVERSAL

1. MAINTAINABILITY

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

1.1-I. TEST OBJECTIVE

The objective of this test is to check the accessibility of components and subsystems.

1.1-II. TEST DESCRIPTION

Accessibility of components and subsystems is checked, and where accessibility is restricted the subsystem is noted along with the reason for the restriction.

1.1-III. DISCUSSION

The components covered in Section 1.3 (Repair and/or Replacement of Selected Subsystems) along with all other components were found to be readily accessible and no restrictions were noted.

ACCESSIBILITY DATA FORM

Bus Number: 9910	Date: 5-12-99

Component	Checked	Comments
ENGINE :		
Oil Dipstick	✓	
Oil Filler Hole	✓	
Oil Drain Plug	✓	
Oil Filter	✓	
Fuel Filter	✓	
Air Filter	✓	Limited access to the top of engine
Belts	✓	
Coolant Level	✓	
Coolant Filler Hole	✓	
Coolant Drain	✓	
Spark / Glow Plugs	✓	
Alternator	✓	
Diagnostic Interface Connector	✓	
TRANSMISSION :		
Fluid Dip-Stick	✓	
Filler Hole	✓	
Drain Plug	N/A	
SUSPENSION :		
Bushings	✓	
Shock Absorbers	✓	
Air Springs	✓	
Leveling Valves	N/A	
Grease Fittings	✓	

ACCESSIBILITY DATA FORM

Bus Number: 9910	Date: 5-12-99

Component	Checked	Comments
HVAC :		
A/C Compressor	✓	
Filters	✓	
Fans	✓	
ELECTRICAL SYSTEM :		
Fuses	✓	
Batteries	✓	Aux. Battery has limited removal access.
Voltage regulator	N/A	
Voltage Convertors	✓	
Lighting	✓	
MISCELLANEOUS :		
Brakes	✓	
Handicap Lifts/Ramps	N/A	
Instruments	✓	
Axles	✓	
Exhaust	✓	
Fuel System	✓	
OTHERS :		

1.2 SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND MAINTENANCE DURING TESTING

1.2-I. TEST OBJECTIVE

The objective of this test is to collect maintenance data about the servicing, preventive maintenance, and repair.

1.2.-II. TEST DESCRIPTION

The test will be conducted by operating the NBM and collecting the following data on work order forms and a driver log.

1. Unscheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Description of malfunction
    e. Location of malfunction (e.g., in service or undergoing inspection)
    f. Repair action and parts used
    g. Man-hours required

2. Scheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Engine running time (if available)
    e. Results of scheduled inspections
    f. Description of malfunction (if any)
    g. Repair action and parts used (if any)
    h. Man-hours required

The buses will be operated in accelerated durability service. While typical items are given below, the specific service schedule will be that specified by the manufacturer.

A. Service
    1. Fueling
    2. Consumable checks
    3. Interior cleaning

B. Preventive Maintenance
    4. Brake adjustments
    5. Lubrication
    6. 3,000 mi (or equivalent) inspection

    7. Oil and filter change inspection

8. Major inspection
9. Tune-up

C. Periodic Repairs

1. Brake reline
2. Transmission change
3. Engine change
4. Windshield wiper motor change
5. Stoplight bulb change
6. Towing operations
7. Hoisting operations

1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance. Table 1 is a list of the lubricating products used in servicing. Finally, the Unscheduled Maintenance List along with Unscheduled Maintenance related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction occurred, a description of the malfunction and repair, and the time required to perform the repair.

SCHEDULED MAINTENANCE

Glavel 9910

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
05-25-99	729	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
06-02-99	1,598	P.M. / Inspection Fuel Economy Prep.	Linkage, tie rods, universals/u-joints all lubed. Oil changed. Oil, fuel, and air filters changed. Transmission oil and filter changed.	8.00	8.00
06-15-99	3,052	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-02-99	3,798	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-14-99	6,772	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00

Table 1. STANDARD LUBRICANTS

The following is a list of Texaco lubricant products used in bus testing conducted by the Penn State University Altoona Bus Testing Center:

ITEM	PRODUCT CODE	TEXACO DESCRIPTION
Engine oil	#2112	URSA Super Plus SAE 30
Transmission oil	#1866	Automatic Trans Fluid Mercon/Dexron II Multipurpose
Gear oil	#2316	Multigear Lubricant EP SAE 80W90
Wheel bearing & Chassis grease	#1935	Starplex II

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

1.3-I. TEST OBJECTIVE

The objective of this test is to establish the time required to replace and/or repair selected subsystems.

1.3-II. TEST DESCRIPTION

The test will involve components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that fails during the NBM testing is added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

1.3-III. DISCUSSION

During the test, several additional components were removed for repair or replacement. Following is a list of components and total repair/replacement time.

	MAN HOURS
Right side rear view mirror.	0.5

At the end of the test, the remaining items on the list were removed and replaced. The transmission assembly took 9.0 man-hours (two men 4.5 hrs) to remove and replace. The time required for repair/replacement of the four remaining components is given on the following Repair and/or Replacement Form.

REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
Transmission	9.0 man hours
Wiper Motor	0.7 man hours
Starter	0.7 man hours
Alternator	0.7 man hours
Batteries	0.5 man hours

2. RELIABILITY - DOCUMENTATION OF BREAKDOWN AND REPAIR TIMES DURING TESTING

2-I. TEST OBJECTIVE

The objective of this test is to document unscheduled breakdowns, repairs, down time, and repair time that occur during testing.

2-II. TEST DESCRIPTION

Using the driver log and unscheduled work order forms, all significant breakdowns, repairs, man-hours to repair, and hours out of service are recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

(a) Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.

(b) Class 2: Road Call. A failure resulting in an enroute interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.

© Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.

(d) Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

2-III. DISCUSSION

A listing of breakdowns and unscheduled repairs is accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above. These classifications are somewhat subjective as the test is performed on a test track with careful inspections every two hours. However, even on the road, there is considerable latitude on deciding how to handle many failures.

The Unscheduled Repair List is also attached to provide a reference for the repairs that are included in the Reliability Data Forms.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were no Class 1 or 2 failures. Of the seven Class 3 failures, four occurred in the exhaust system, and one each with the body, engine and frame. These, and the one remaining Class 4 failure are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

RELIABILITY DATA FORMS

Bus Number: 9910	Date: 7-9-99
Personnel: Bob Reifsteck	

	Failure Type					
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Exhaust System		571			1.00	1.00
		2,118			1.00	1.00
		2,531			1.50	1.50
		3,180			6.00	6.00
Body	571				0.50	0.50
		4,586			3.00	3.00
Engine/Transmission		0			1.00	1.00
Frame		2,720			3.00	3.00

3. SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3-I. TEST OBJECTIVE

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

3-II. TEST DESCRIPTION

The Safety Test is a vehicle handling and stability test. The bus will be operated at SLW on a smooth and level test track. The bus will be driven through a double lane change course at increasing speed until the test is considered unsafe or a speed of 45 mph is reached. The lane change course will be set up using pylons to mark off two 12 foot center to center lanes with two 100 foot lane change areas 100 feet apart. The bus will begin in one lane, change to the other lane in a 100 foot span, travel 100 feet, and return to the original lane in another 100 foot span. This procedure will be repeated, starting first in the right-hand and then in the left-hand lane.

3-III. DISCUSSION

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph.

SAFETY DATA FORM

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	

Temperature (°F): 75	Humidity (%): 50
Wind Direction: SW	Wind Speed (mph): 7
Barometric Pressure (in.Hg): 30.20	

SAFETY TEST: DOUBLE LANE CHANGE	
Maximum safe speed tested for double-lane change to left	45 mph
Maximum safe speed tested for double-lane change to right	45 mph
Comments of the position of the bus during the lane change:	
A safe profile was maintained through all portions of testing.	
Comments of the tire/ground contact patch:	
Tire/ground contact was maintained through all portions of testing.	

3. SAFETY

RIGHT - HAND APPROACH

LEFT - HAND APPROACH

4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus will be operated at SLW on the skid pad at the Test Track Facility. The bus will be accelerated at full throttle from a standstill to a maximum "geared" or "safe" speed as determined by the test driver. The vehicle speed is measured using a Correvit non-contacting speed sensor. The times to reach speed between ten mile per hour increments are measured and recorded using a stopwatch with a lap timer. The time to speed data will be recorded on the Performance Data Form and later used to generate a speed vs time plot and gradeability calculations.

4-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 18.55 seconds.

PERFORMANCE DATA FORM

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	

Temperature (°F): 75	Humidity (%): 50
Wind Direction: SW	Wind Speed (mph): 7
Barometric Pressure (in.Hg): 30.20	

Air Conditioning compressor-OFF	✓ Checked
Ventilation fans-ON HIGH	✓ Checked
Heater pump motor-Off	✓ Checked
Defroster-OFF	✓ Checked
Exterior and interior lights-ON	✓ Checked
Windows and doors-CLOSED	✓ Checked

ACCELERATION, GRADEABILITY, TOP SPEED

Counter Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	2.92	2.64	2.69
20 mph	5.48	5.42	5.04
30 mph	8.32	8.36	8.19
40 mph	12.85	12.42	12.44
Top Test Speed(mph) 50	19.30	19.26	19.03

Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	2.86	2.85	2.70
20 mph	5.33	5.07	4.79
30 mph	8.17	8.14	7.82
40 mph	11.92	11.89	11.76
Top Test Speed(mph) 50	18.05	18.04	17.64

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :GLAVEL
BUS MODEL :UNIVERSAL
BUS NUMBER :9910
TEST DATE :6/23/99

TEST CONDITIONS :

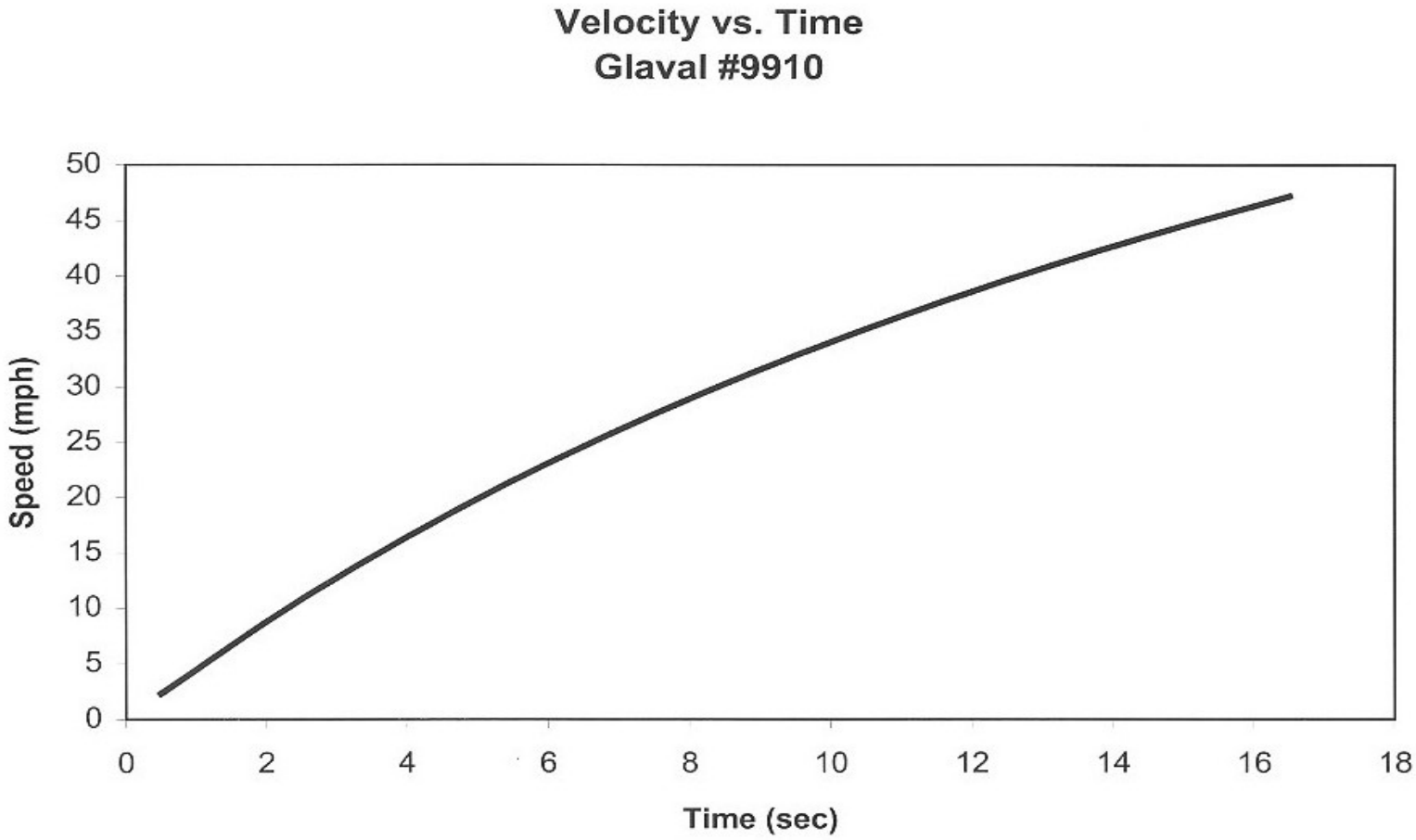
TEMPERATURE (DEG F) : 75.0
WIND DIRECTION : SW
WIND SPEED (MPH) : 7.0
HUMIDITY (%) : 50
BAROMETRIC PRESSURE (IN. HG) : 30.2

VEHICLE SPEED	AVERAGE TIME (SEC)		
(MPH)	CCW DIRECTION	CW DIRECTION	TOTAL
10.0	2.75	2.80	2.78
20.0	5.31	5.06	5.19
30.0	8.29	8.04	8.17
40.0	12.57	11.86	12.21
50.0	19.20	17.91	18.55

TEST SUMMARY :

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.21	6.8	21.6
5.0	1.10	6.4	20.3
10.0	2.30	5.9	18.5
15.0	3.61	5.4	16.9
20.0	5.04	4.9	15.3
25.0	6.63	4.4	13.7
30.0	8.41	3.9	12.2
35.0	10.40	3.5	10.8
40.0	12.66	3.0	9.5
45.0	15.24	2.6	8.2
50.0	18.25	2.3	7.0

NOTE : Gradeability results were calculated from performance test data. Actual sustained gradeability performance for vehicles equipped with auto transmission may be lower than the values indicated here.


Velocity vs. Time
Glaval #9910
Speed (mph)
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
Time (sec)

5. STRUCTURAL INTEGRITY

5.1 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL SHAKEDOWN TEST

5.1-I. DISCUSSION

The objective of this test is to determine certain static characteristics (e.g., bus floor deflection, permanent structural deformation, etc.) under static loading conditions.

5.1-II. TEST DESCRIPTION

In this test, the bus will be isolated from the suspension by blocking the vehicle under the suspension points. The bus will then be loaded and unloaded up to a maximum of three times with a distributed load equal to 2.5 times gross load. Gross load is 150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space. For a distributed load equal to 2.5 times gross load, place a 375-lb load on each seat and on every 1.5 sq ft of free floor space. The first loading and unloading sequence will "settle" the structure. Bus deflection will be measured at several locations during the loading sequences.

5.1-III. DISCUSSION

This test was performed based on a maximum passenger capacity of 36 people including the driver. The resulting test load is (36 x 375 lb) = 13,500 lb. The load is distributed evenly over the passenger space. Deflection data before and after each loading and unloading sequence is provided on the Structural Shakedown Data Form.

The unloaded height after each test becomes the original height for the next test. Some initial settling is expected due to undercoat compression, etc. After each loading cycle, the deflection of each reference point is determined. The bus is then unloaded and the residual (permanent) deflection is recorded. On the final test, the maximum loaded deflection was 0.069 inches at reference point 4. The maximum permanent deflection after the final loading sequence ranged from -0.001 inches at reference points 2, 3, and 9 to 0.002 inches at reference point 12.

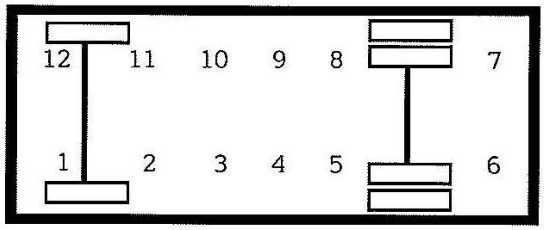
STRUCTURAL SHAKEDOWN DATA FORM

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., D.L., C.S. and M.H.	Temperature (°F): 66
Loading Sequence: ☒ 1 ☐ 2 ☐ 3 (check one) Test Load (lbs): 13,500	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus



Left

Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	0	.065	.057	.009	.001
2	0	.046	.044	.001	-.001
3	0	.059	.057	.001	-.001
4	0	.068	.069	-.001	.000
5	0	.046	.043	.003	.000
6	0	.094	.050	.045	.001
7	0	.083	.048	.036	.001
8	0	.048	.046	.002	.000
9	0	.062	.059	.002	-.001
10	0	.057	.056	.001	.000
11	0	.047	.047	.000	.000
12	0	.051	.038	.015	.002

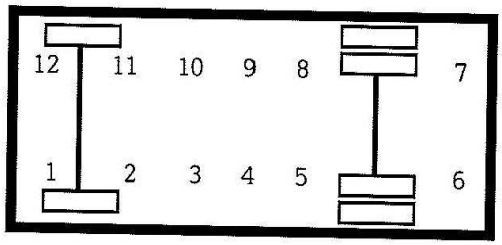
STRUCTURAL SHAKEDOWN DATA FORM

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., D.L., C.S. and M. H.	Temperature (°F): 66
Loading Sequence: ☐ 1 ☒ 2 ☐ 3 (check one) Test Load (lbs): 13,500	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus



Left

Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	.008	.065	.057	.009	.011
2	.002	.046	.044	.001	-.001
3	.002	.059	.057	.001	-.001
4	-.001	.068	.069	-.001	.000
5	.003	.046	.043	.003	.000
6	.044	.094	.050	.045	.001
7	.035	.083	.048	.036	.001
8	.002	.048	.046	.002	.000
9	.003	.062	.059	.002	-.001
10	.001	.057	.056	.001	.000
11	.000	.047	.047	.000	.000
12	.013	.051	.038	.015	.002

5.1 STRUCTURAL SHAKEDOWN TEST

DIAL INDICATORS IN POSITION

TEST BUS LOADED TO 2.5 TIMES GVL

5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

5.2-I. TEST OBJECTIVE

The objective of this test is to observe the operation of the bus subsystems when the bus is placed in a longitudinal twist simulating operation over a curb or through a pothole.

5.2-II. TEST DESCRIPTION

With the bus loaded to GVWR, each wheel of the bus will be raised (one at a time) to simulate operation over a curb and the following will be inspected:

1. Body
2. Windows
3. Doors
4. Roof vents
5. Special seating
6. Undercarriage
7. Engine
8. Service doors
9. Escape hatches
10. Steering mechanism

Each wheel will then be lowered (one at a time) to simulate operation through a pothole and the same items inspected.

5.2-III. DISCUSSION

The test sequence was repeated ten times. The first and last test is with all wheels level. The other eight tests are with each wheel 6 inches higher and 6 inches lower than the other three wheels.

All doors, windows, escape mechanisms, engine, and steering operated normally throughout the test. The undercarriage and body indicated no deficiencies. No water leakage was observed during the test. The results of this test are indicated on the following data forms.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
All wheels level	☒ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
Right front	☐ 6 in higher	☐ 6 in lower
Right rear	☐ 6 in higher	☐ 6 in lower
Left rear	☐ 6 in higher	☐ 6 in lower
Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
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Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
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Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

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	Comments
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☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
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DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

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☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L. D.L. and M.H.	Temperature(°F): 70

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☒ Undercarriage	No deficiencies.
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☒ Body	No deficiencies.
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DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
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Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
All wheels level	☐ before	☐ after
Left front	☐ 6 in higher	☐ 6 in lower
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Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

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Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
All wheels level	☐ before	☐ after
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	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies.
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Bus Number: 9910	Date: 5-18-99
Personnel: B.L., E.L., D.L. and M.H.	Temperature(°F): 70

Wheel Position : (check one)		
All wheels level	☐ before	☒ after
Left front	☐ 6 in higher	☐ 6 in lower
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Right center	☐ 6 in higher	☐ 6 in lower
Left center	☐ 6 in higher	☐ 6 in lower

	Comments
☒ Windows	No deficiencies.
☒ Front Doors	No deficiencies.
☒ Rear Doors	No deficiencies.
☒ Escape Mechanisms/ Roof Vents	No deficiencies.
☒ Engine	No deficiencies.
☒ Handicapped Device/ Special Seating	NA
☒ Undercarriage	No deficiencies
☒ Service Doors	No deficiencies.
☒ Body	No deficiencies.
☒ Windows/ Body Leakage	No deficiencies.
☒ Steering Mechanism	No deficiencies.

5.2 STRUCTURAL DISTORTION TEST

RIGHT REAR WHEEL 6" LOWER

LEFT FRONT WHEEL 6" HIGHER

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

5.3-II. TEST DESCRIPTION

Utilizing a load-distributing yoke, a hydraulic cylinder is used to apply a static tension load equal to 1.2 times the bus curb weight. The load will be applied to both the front and rear, if applicable, towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure will be recorded.

5.3-III. DISCUSSION

The load-distributing yoke was incorporated as the towing interface between the bus submitted for testing is not equipped with any type of tow eyes or tow hooks; therefore the Static Towing Test was not performed.

5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST

5.4-I. TEST OBJECTIVE

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

5.4-II. TEST DESCRIPTION

This test requires the bus be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus will be towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus will be visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms will be inspected for proper operation.

5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by Chaining to the front axle. A front lift tow was performed with no problems encountered with the towing interface. Rear towing is not recommended by the manufacturer. No damage or deformation was observed during the test.

DYNAMIC TOWING TEST DATA FORM

Bus Number: 9910	Date: 7-9-99
Personnel: B.L. and R.H.	

Temperature (°F): 80	Humidity (%): 42
Wind Direction: NNW	Wind Speed (mph): 6
Barometric Pressure (in. Hg): 30.09	

Inspect tow equipment-bus interface.
Comments: A safe and adequate connection was made between the tow equipment and the bus.
Inspect tow equipment-wrecker interface.
Comments: A safe and adequate connection was made between the tow
equipment and the wrecker.
Towing Comments: A front lift tow was performed by chaining to the front axle.
Description and location of any structural damage: None noted.
General Comments: Manufacturer does not recommend towing from the rear.

5.4 DYNAMIC TOWING TEST

TOWING INTERFACE

TOWING INTERFACE

TEST BUS IN TOW

5.5 STRUCTURAL STRENGTH AND DISTORTION

TESTS - JACKING TEST

5.5-I. TEST OBJECTIVE

The objective of this test is to inspect for damage due to the deflated tire, and determine the feasibility of jacking the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.

5.5-II. TEST DESCRIPTION

With the bus at curb weight, the tire(s) at one corner of the bus are replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack is then positioned in a manner and location specified by the manufacturer and used to raise the bus to a height sufficient to provide 3-in clearance between the floor and an inflated tire. The deflated tire(s) are replaced with the original tire(s) and the jack is lowered. Any structural damage or permanent deformation is recorded on the test data sheet. This procedure is repeated for each corner of the bus.

5.5-III. DISCUSSION

The jack used for this test has a minimum height of 8.5 inches. During the deflated portion of the test, the jacking point clearances ranged from 8.5 inches to 16.2 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle - one tire flat	15.5"
Rear axle - one tire flat	16.2"
Rear axle - two tires flat	14.8"

JACKING TEST DATA FORM

Bus Number: 9910	Date: 5-11-99
Personnel: S.C. and G.F.	Temperature: 70

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	18.1" I 15.5" D	11.4" I 8.5" D	
Left front	18.1“ I 15.5" D	11.3" I 8.5" D	
Right rear--outside	16.8" I 16.2" D	11.6" I 11.1" D	
Right rear--both	16.8" I 14.8" D	11.6" I 9.1" D	
Left rear--outside	16.9" I 16.2" D	11.6" I 11.0" D	
Left rear--both	16.9" I 14.8" D	11.6" I 9.2" D	
Right middle or tag--outside	NA	NA	
Right middle or tag--both	NA	NA	
Left middle or tag--outside	NA	NA	
Left middle or tag--both	NA	NA	

Additional comments of any deformation or difficulty during jacking:
No damage, deformation or problems were observed.

5.6 STRUCTURAL STRENGTH AND DISTORTION

TESTS - HOISTING TEST

5.6-I. TEST OBJECTIVE

The objective of this test is to determine possible damage or deformation caused by the jack/stands.

5.6-II. TEST DESCRIPTION

With the bus at curb weight, the front end of the bus is raised to a height sufficient to allow manufacturer-specified placement of jack stands under the axles or jacking pads independent of the hoist system. The bus will be checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure is repeated for the rear end of the bus. The procedure is then repeated for the front and rear simultaneously.

5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and standard 19 inch jack stands. The bus was hoisted from the front wheel, rear wheel, and then the front and rear wheels simultaneously and placed on jack stands.

The bus easily accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted.

HOISTING TEST DATA FORM

Bus Number: 9910	Date: 5-11-99
Personnel: S.C. and G.S.	Temperature (°F): 72

Comments of any structural damage to the jacking pads or axles while both the front wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the rear wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the front and rear wheels are supported by the jack stands:
None noted.

5.6 HOISTING TEST

TEST BUS STABLE ON JACK STANDS

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates up to 25 percent of the service life of the vehicle.

5.7-II. TEST DESCRIPTION

The test vehicle is driven a total of 5,050 miles; approximately 3,750 miles on the Durability Test Track and approximately 1,300 miscellaneous other miles. The test will be conducted with the bus operated under three different loading conditions. The first segment will consist of approximately 2,125 miles with the bus operated at GVW. The second segment will consist of approximately 800 miles with the bus operated at SLW. The remainder of the test, approximately 2,125 miles, will be conducted with the bus loaded to CW. If GVW exceeds the axle design weights, then the load will be adjusted to the axle design weights and the change will be recorded. All subsystems are run during these tests in their normal operating modes. All recommended manufacturers servicing is to be followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests will be compressed by 10:1; all others will be done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs are recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle shall be washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on May 20, 1999 and was conducted until July 9, 1999. The first 2,125 miles were performed at a GVW of 13,730 lb. In order to avoid exceeding the GAWR of the rear axle (9,450 lbs), ballast for all 10 standing and 1 rear seated passenger was eliminated. The GVW segment was completed on June 4, 1999. The next 800 mile SLW segment was performed at the same 13,730 lbs and completed on June 8, 1999. The final 2,125 mile segment was performed at a CW of 10,110 lb and completed on July 9, 1999.

The mileage summary presents the accumulation of miles during the Structural Durability Test. The driving schedule is included, showing the operating duty cycle. A detailed plan view of the Test Track Facility and Durability Test Track are attached for reference. The amplitude and profile for each element of the durability test track is also included. Finally, a list of unscheduled maintenance is included describing the failures that were encountered along with related photographs during the Structural Durability Test.

GLAVAL - TEST BUS # 9910
SUMMARY - MILEAGE DRIVEN

DATE	TOTAL OTHER MILES	TOTAL DURABILITY TRACK	TOTAL
05/20/99 TO 05/26/99	183.00	580.00	763.00
05/27/99 TO 06/02/99	133.00	526.00	659.00
06/03/99 TO 06/09/99	153.00	867.00	1,020.00
06/10/99 TO 06/16/99	242.00	287.00	529.00
06/17/99 TO 06/23/99	98.00	61.00	159.00
06/24/99 TO 06/30/99	245.00	859.00	1,104.00
07/01/99 TO 07/07/99	198.00	570.00	768.00
07/08/99 TO 07/14/99	277.00	0.00	277.00
TOTAL	1,529.00	3,750.00	5,279.00

Table 4. Driving Schedule for Bus Operation on the Durability Test Track.

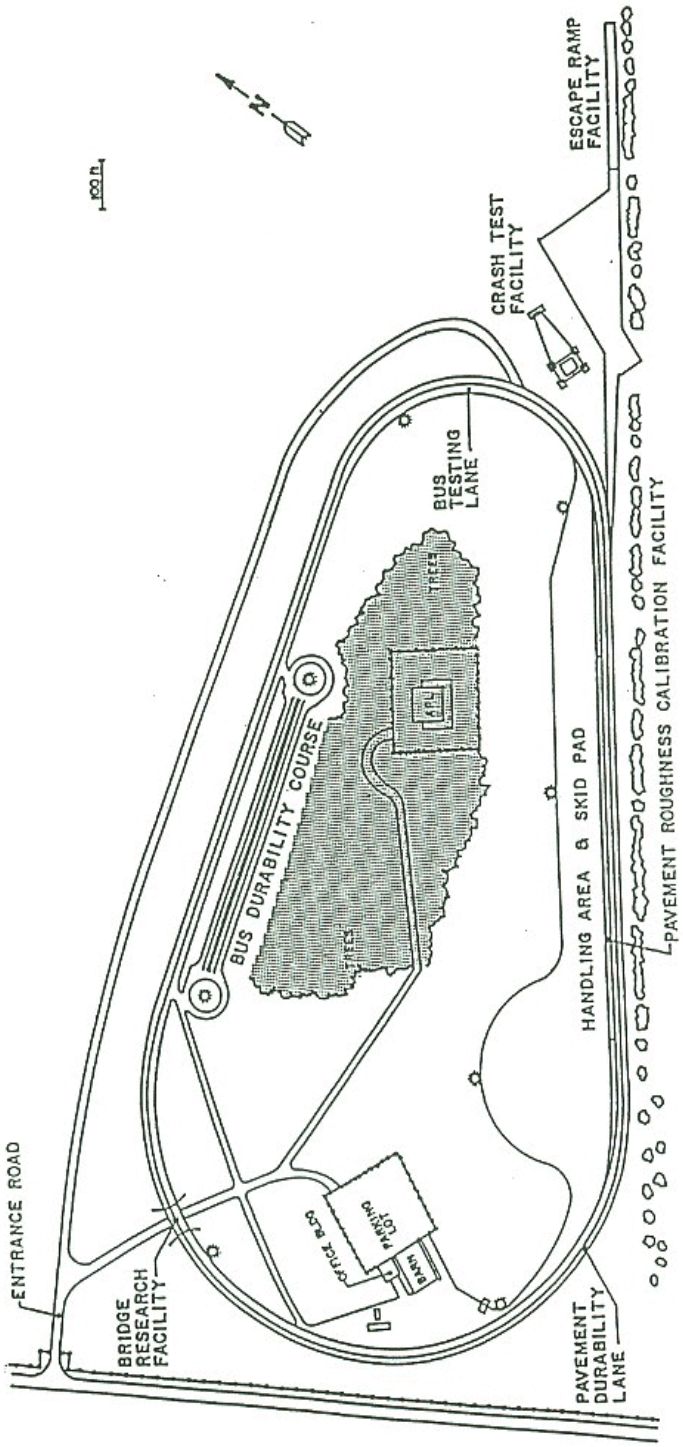
STANDARD OPERATING SCHEDULE

Monday through Friday

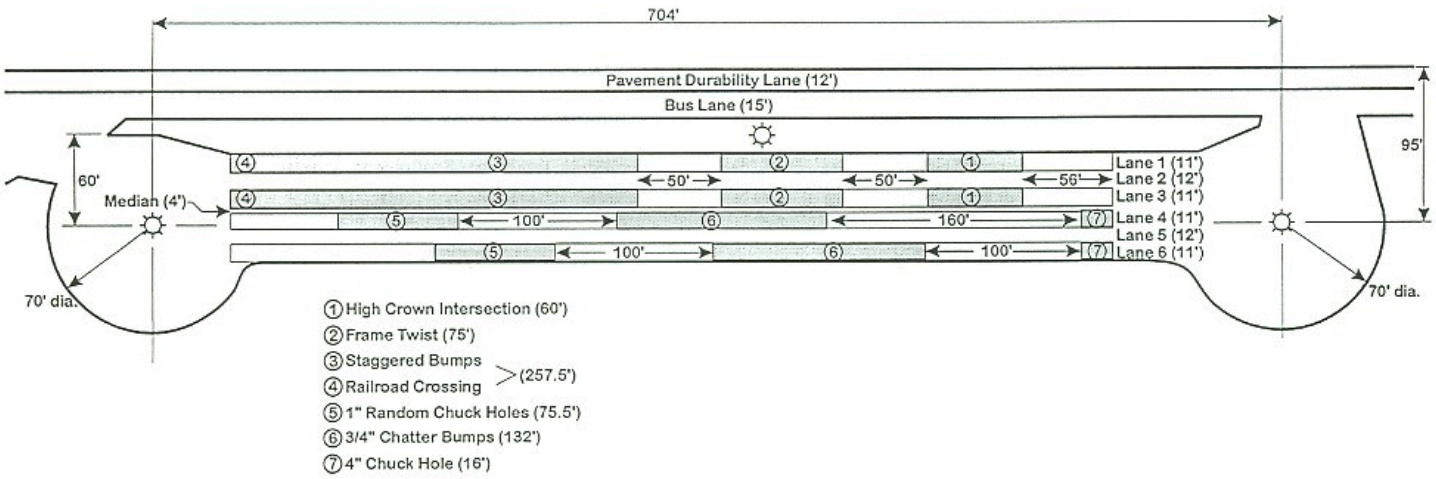
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
Shift 2	8:00 am	D
	9:40 am	C
	9:50 am	B
	10:00 am	D
	11:35 am	C
	11:45 am	B
	12:05 pm	D
	1:40 pm	C
	1:50 pm	B
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
Shift 3	4:00 pm	D
	5:40 pm	C
	5:50 pm	B
	6:00 pm	D
	7:40 pm	C
	7:50 pm	B
	8:05 pm	D
	9:40 pm	C
	9:50 pm	B
	10:00 pm	D
	11:40 pm	C
	11:50 pm	F

B---Break
C----Cycle all systems five times, visual inspection, driver's log entries
D---Drive bus as specified by procedure
F----Fuel bus, complete driver's log shift entries

"PLAN VIEW OF PENN STATE BUS TESTING AND RESEARCH FACILITY"



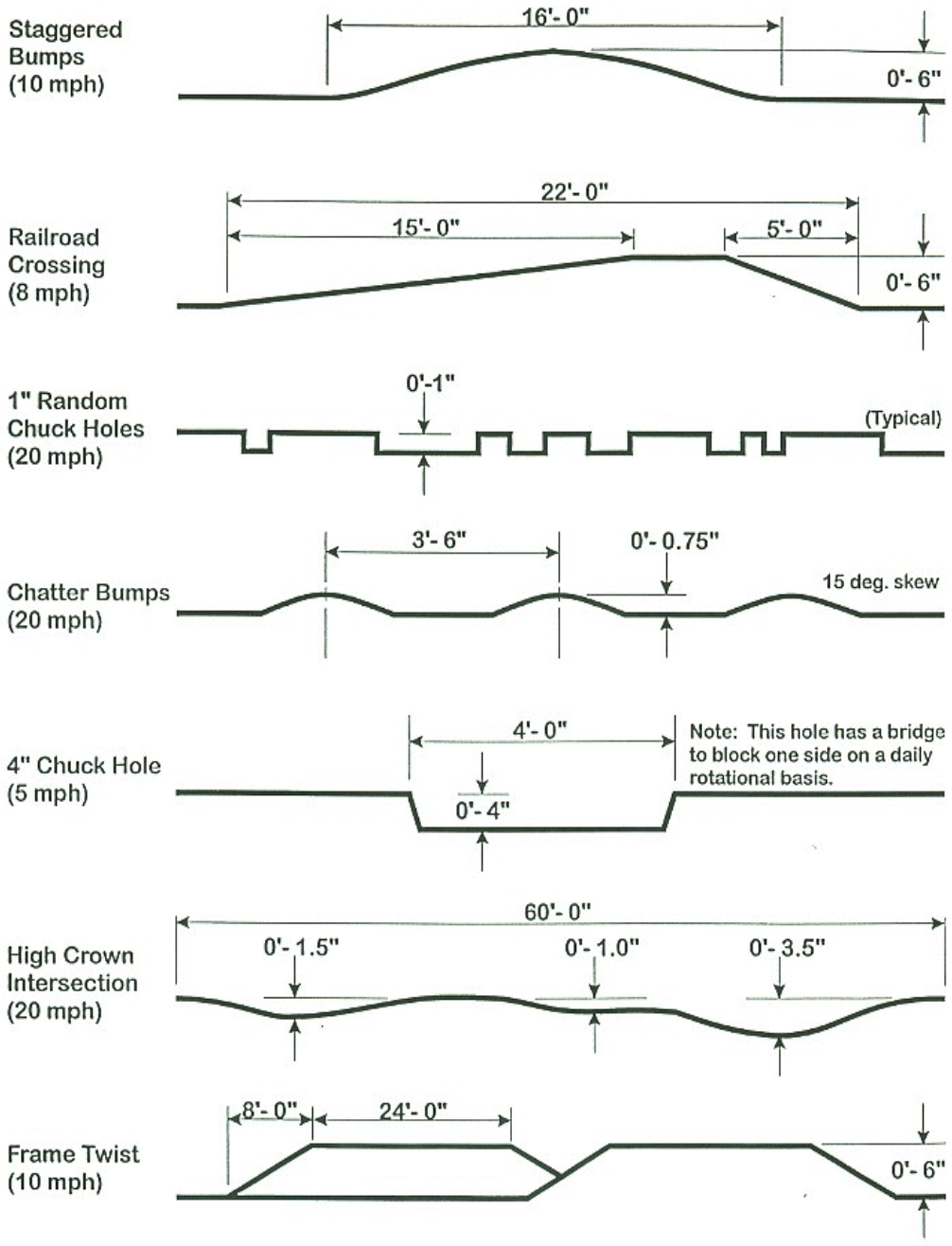
BUS TESTING AND RESEARCH TEST TRACK
UNIVERSITY PARK, PA



Plan View

Vehicle Durability Test Track

The Pennsylvania Transportation Institute
Penn State



Durability Element Profiles

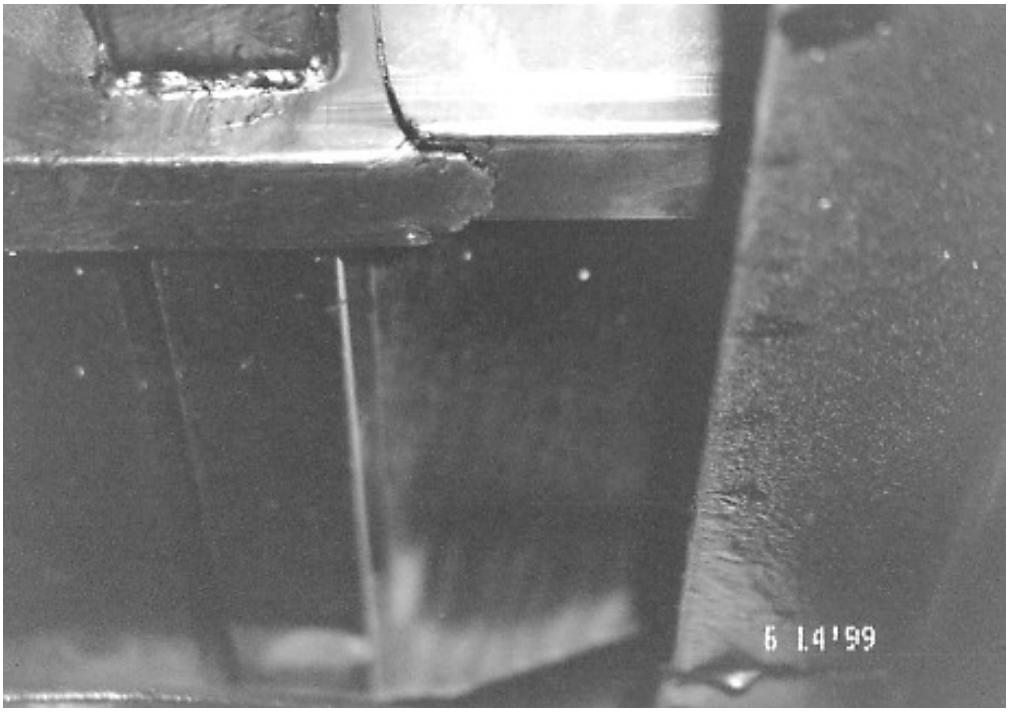
The Pennsylvania Transportation Institute
Penn State

UNSCHEDULED MAINTENANCE

Glavel 9910

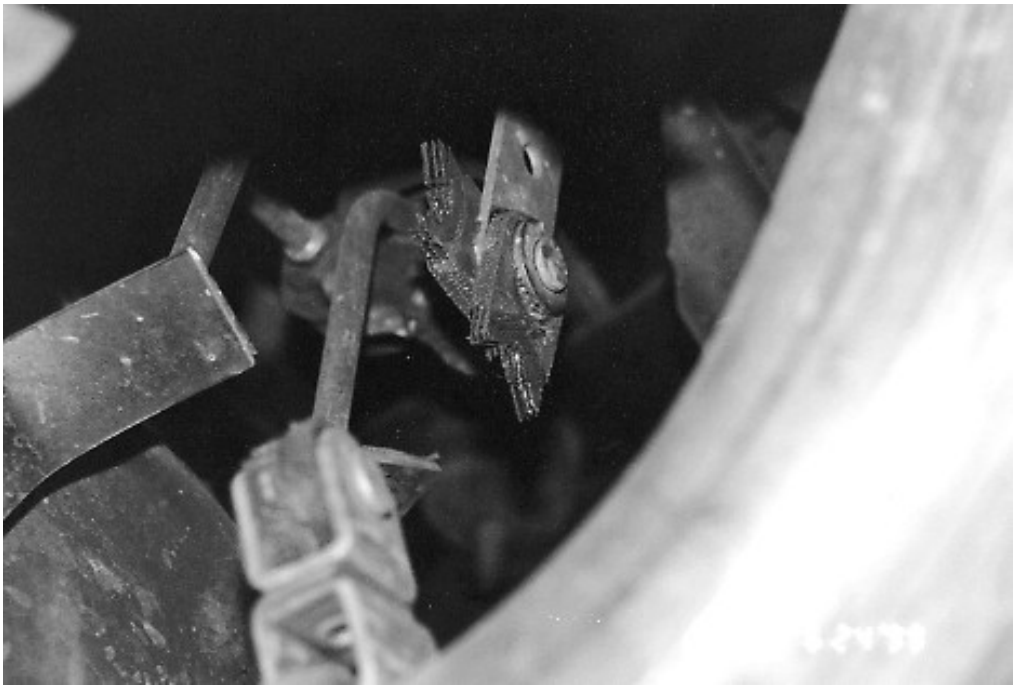
DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
05-19-99	0	The "Service Engine Soon" light is on.	Checked for codes with scanner. Found code PO113 (IAT CKT voltage high). Sensor disconnected, re-connected, code cleared.	1.00	1.00
05-25-99	571	The exhaust pipe has separated.	Repaired with a band clamp.	1.00	1.00
05-25-99	571	The right side rear view mirror was broken upon arrival.	New mirror arrived and was installed.	0.50	0.50
06-08-99	2,118	The rear exhaust pipe hanger is broken.	Hanger welded/repaired and a new hanger added on the tail pipe.	1.00	1.00
06-11-99	2,531	The exhaust system is loose. Hangers are broken.	Installed universal hangers at the tailpipe, muffler and middle pipe. One hanger welded/repaired.	1.50	1.50
06-14-99	2,720	Three, 2" square tube frame cross members are cracked. Two are left side, forward of the rear axle and one is right side, rear of the rear axle.	All cracked cross members welded/repaired.	3.00	3.00
06-24-99	3,180	The entire exhaust system is loose, three hangers are broken.	Removed the exhaust system from the catalytic convertor back. Installed a 6" extension, replaced three broken hangers and added one free floating hanger near the rear of the system.	6.00	6.00
07-02-99	4,586	The roof seam is separating above the entrance door.	Removed hold down straps. Re-drilled holes and installed ten new screws.	3.00	3.00

UNSCHEDULED MAINTENANCE

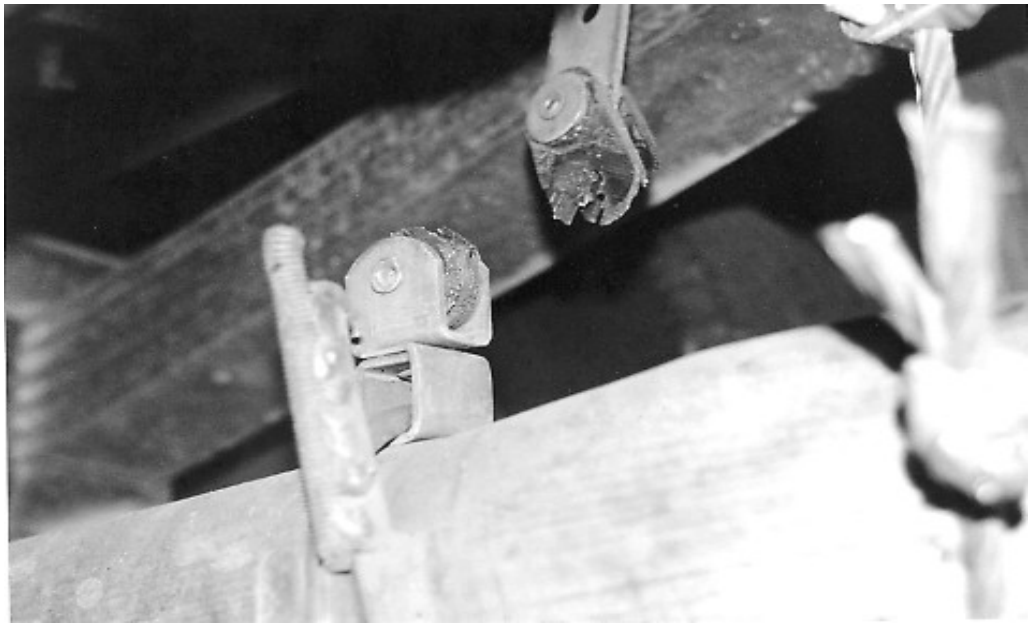


CRACKED FRAME CROSS MEMBER
(2,720 TEST MILES)

UNSCHEDULED MAINTENANCE CONT.



BROKEN EXHAUST HANGER
(3,180 TEST MILES)



UNSCHEDULED MAINTENANCE CONT.

SEPARATED ROOF SEAM ABOVE ENTRANCE DOOR (4,586 TEST MILES)

6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This fuel economy test, as designated here, is a measurement of the fuel expended by a vehicle traveling a specified test loop under specified operating conditions. The results of this test will not represent actual mileage but will provide data that can be used by recipients to compare buses tested by this procedure.

6-II. TEST DESCRIPTION

This test requires operation of the bus over a course based on the Transit Coach Operating Duty Cycle (ADB Cycle) at seated load weight using a procedure based on the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82. The procedure has been modified by elimination of the control vehicle and by modifications as described below. The inherent uncertainty and expense of utilizing a control vehicle over the operating life of the facility is impractical.

The fuel economy test will be performed as soon as possible (weather permitting) after the completion of the GVW portion of the structural durability test. It will be conducted on the bus test lane at the Test Track Facility. Signs are erected at carefully measured points which delineate the test course. A test run will comprise 3 CBD phases, 2 Arterial phases, and 1 Commuter phase. An electronic fuel measuring system will indicate the amount of fuel consumed during each phase of the test. The test runs will be repeated until there are at least two runs in both the clockwise and counterclockwise directions in which the fuel consumed for each run is within ± 4 percent of the average total fuel used over the 4 runs. A 20-minute idle consumption test is performed just prior to and immediately after the driven portion of the fuel economy test. The amount of fuel consumed while operating at normal/low idle is recorded on the Fuel Economy Data Form. This set of four valid runs along with idle consumption data comprise a valid test.

The test procedure is the ADB cycle with the following four modifications:

1. The ADB cycle is structured as a set number of miles in a fixed time in the following order: CBD, Arterial, CBD, Arterial, CBD, Commuter. A separate idle fuel consumption measurement is performed at the beginning and end of the fuel economy test. This phase sequence permits the reporting of fuel consumption for each of these phases separately, making the data more useful to bus manufacturers and transit properties.

2. The operating profile for testing purposes shall consist of simulated transit type service at seated load weight. The three test phases (figure 6-1) are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph; an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph; and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph. At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.

3. The individual ADB phases remain unaltered with the exception that 1 mile has been changed to 1 lap on the test track. One lap is equal to 5,042 feet. This change is accommodated by adjusting the cruise distance and time.

4. The acceleration profile, for practical purposes and to achieve better repeatability, has been changed to "full throttle acceleration to cruise speed".

Several changes were made to the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82:

1. Sections 1.1, and 1.2 only apply to diesel, gasoline, methanol, and any other fuel in the liquid state (excluding cryogenic fuels).

1.1 SAE 1376 July 82 requires the use of at least a 16-gal fuel tank. Such a fuel tank when full would weigh approximately 160 lb. It is judged that a 12-gal tank weighing approximately 120 lb will be sufficient for this test and much easier for the technician and test personnel to handle.

1.2 SAE 1376 July 82 mentions the use of a mechanical scale or a flowmeter system. This test procedure uses a load cell readout combination that provides an accuracy of 0.5 percent in weight and permits on-board weighing of the gravimetric tanks at the end of each phase. This modification permits the determination of a fuel economy value for each phase as well as the overall cycle.

2. Section 2.1 applies to compressed natural gas (CNG), liquified natural gas (LNG), cryogenic fuels, and other fuels in the vapor state.

2.1 A laminar type flowmeter will be used to determine the fuel consumption. The pressure and temperature across the flow element will be monitored by the flow computer. The flow computer will use this data to calculate the gas flow rate. The flow computer will also display the flow rate (scfm) as well as the total fuel used (scf). The total fuel used (scf) for each phase will be recorded on the Fuel Economy Data Form.

3. Use both sections 1 and 2 for dual fuel systems.

FUEL ECONOMY CALCULATION PROCEDURE

A. For diesel, gasoline, methanol and fuels in the liquid state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (pounds); standard reference values--density of water at 60°F (8.3373 lbs/gal) and volumetric heating value of standard fuel; and test fuel specific gravity (unitless) and volumetric heating value (BTU/gal). These combine to give a fuel economy in miles per gallon (mpg) which is corrected to a standard gallon of fuel referenced to water at 60°F. This eliminates fluctuations in fuel economy due to fluctuations in fuel quality. This calculation has been programmed into a computer and the data processing is performed automatically.

The fuel economy correction consists of three steps:

1.) Divide the number of miles of the phase by the number of pounds of fuel consumed

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/lb}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb of fuel}}$$

2.) Convert the observed fuel economy to miles per gallon [mpg] by multiplying by the specific gravity of the test fuel Gs (referred to water) at 60°F and multiply by the density of water at 60°F

$$\mathbf{FEo_{mpg}} = \mathbf{FEc_{mi/lb}} \times Gs \times Gw$$

where **Gs** = Specific gravity of test fuel at 60°F (referred to water)
Gw = 8.3373 lb/gal

3.) Correct to a standard gallon of fuel by dividing by the volumetric heating value of the test fuel (H) and multiplying by the volumetric heating value of standard reference fuel (Q). Both heating values must have the same units.

$$\mathbf{FEc} = \mathbf{FEo_{mpg}} \times \frac{Q}{H}$$

where

H = Volumetric heating value of test fuel [BTU/gal]
Q = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Rightarrow \quad FEc = \frac{\text{miles}}{\text{lbs}} \times (Gs \times Gw) \times \frac{Q}{H}$$

4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10^6.

Eq = Energy equivalent of converting mpg to mile/BTUx10^6.

$$Eq = ((mpg)/(H))x10^6$$

B. CNG, LNG, cryogenic and other fuels in the vapor state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (scf); density of test fuel, and volumetric heating value (BTU/lb) of test fuel at standard conditions (P=14.73 psia and T=60 °F). These combine to give a fuel economy in miles per lb. The energy equivalent (mile/BTUx10^6) will also be provided so that the results can be compared to buses that use other fuels.

1.) Divide the number of miles of the phase by the number of standard cubic feet (scf) of fuel consumed.

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$FEo_{mi/scf}$ = Observed fuel economy = $\frac{\text{miles}}{\text{scf of fuel}}$

2.) Convert the observed fuel economy to miles per lb by dividing FEo by the density of the test fuel at standard conditions (Lb/ft^3).

Note: The density of test fuel must be determined at standard conditions as described above. If the density is not defined at the above standard conditions, then a correction will be needed before the fuel economy can be calculated.

$$FEo_{mi/lb} = FEo / Gm$$

where Gm = Density of test fuel at standard conditions

3.) Convert the observed fuel economy (FEomi/lb) to an energy equivalent of (miles/BTUx10^6) by dividing the observed fuel economy (FEomi/lb) by the heating value of the test fuel at standard conditions.

$$Eq = ((FEomi/lb)/H)x10^6$$

where

Eq = Energy equivalent of miles/lb to mile/BTUx10^6
H = Volumetric heating value of test fuel at standard conditions

6-III. DISCUSSION

This is a comparative test of fuel economy using number one diesel fuel with a heating value of 20,214.0 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 127,700 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next sheet shows the correction calculation for the test fuel. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD - 6.64 mpg, ART - 7.03 mpg, and COM - 11.76 mpg. Average fuel consumption at idle was 2.78 lb/hr (0.44 gph).

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 9910	Date: 6-15-99	SLW (lbs): 13,730
Personnel: S.C., C.S. and E.L.		

FUEL SYSTEM	OK	Date	Initials
Install fuel measurement system	✓	6-15-99	S.C.
Replace fuel filter	✓	6-15-99	S.C.
Check for fuel leaks	✓	6-15-99	S.C.
Specify fuel type (refer to fuel analysis)			
Remarks:			
BRAKES/TIRES	OK	Date	Initials
Inspect hoses	✓	6-15-99	S.C.
Inspect brakes	✓	6-15-99	S.C.
Relube wheel bearings	✓	6-15-99	S.C.
Check tire inflation pressures (mfg. specs.)	✓	6-15-99	S.C.
Remarks:			
COOLING SYSTEM	OK	Date	Initials
Check hoses and connections	✓	6-15-99	S.C.
Check system for coolant leaks	✓	6-15-99	S.C.
Remarks:			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 2)

Bus Number: 9910	Date: 6-15-99
Personnel: S.C., C.S. and E.L.	

ELECTRICAL SYSTEMS	OK	Date	Initials
Check battery	✓	6-15-99	S.C.
Inspect wiring	✓	6-15-99	S.C.
Inspect terminals	✓	6-15-99	S.C.
Check lighting	✓	6-15-99	S.C.
Remarks:			

DRIVE SYSTEM	OK	Date	Initials
Drain transmission fluid	✓	6-15-99	S.C.
Replace filter/gasket	✓	6-15-99	S.C.
Check hoses and connections	✓	6-15-99	S.C.
Replace transmission fluid	✓	6-15-99	S.C.
Check for fluid leaks	✓	6-15-99	S.C.
Remarks:			

LUBRICATION	OK	Date	Initials
Drain crankcase oil	✓	6-15-99	E.L.
Replace filters	✓	6-15-99	E.L.
Replace crankcase oil	✓	6-15-99	E.L.
Check for oil leaks	✓	6-15-99	E.L.
Check oil level	✓	6-15-99	E.L.
Lube all chassis grease fittings	✓	6-15-99	E.L.
Lube universal joints	✓	6-15-99	E.L.
Replace differential lube including axles	✓	6-15-99	S.C.
Remarks:			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 3)

Bus Number: 9910	Date: 6-15-99
Personnel: S.C., C.S. and E.L.	

EXHAUST/EMISSION SYSTEM	OK	Date	Initials
Check for exhaust leaks	✓	6-15-99	S.C.
Remarks:			

ENGINE	OK	Date	Initials
Replace air filter	✓	6-15-99	E.L.
Inspect air compressor and air system	✓	N/A	
Inspect vacuum system, if applicable	✓	6-15-99	S.C.
Check and adjust all drive belts	✓	6-15-99	S.C.
Check cold start assist, if applicable	✓	6-15-99	S.C.
Remarks:			

STEERING SYSTEM	OK	Date	Initials
Check power steering hoses and connectors	✓	6-15-99	S.C.
Service fluid level	✓	6-15-99	S.C.
Check power steering operation	✓	6-15-99	S.C.
Remarks:			

	OK	Date	Initials
Ballast bus to seated load weight	✓	6-15-99	S.C.

TEST DRIVE	OK	Date	Initials
Check brake operation	✓	6-15-99	S.C.
Check transmission operation	✓	6-15-99	S.C.
Remarks:			

FUEL ECONOMY PRE-TEST INSPECTION FORM

Bus Number: 9910	Date: 6-17-99
Personnel: B.L., S.C. and R.H.	

PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	B.L.
Cold tire pressure (psi): Front 90 Middle N/A Rear 90	B.L.
Tire wear:	B.L.
Engine oil level	B.L.
Engine coolant level	B.L.
Interior and exterior lights on, evaporator fan on	B.L.
Fuel economy instrumentation installed and working properly.	B.L.
Fuel line -- no leaks or kinks	B.L.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	B.L.
Bus is loaded to SLW	B.L.
WARM-UP	**If OK, Initial**
Bus driven for at least one hour warm-up	B.L.
No extensive or black smoke from exhaust	B.L.
POST WARM-UP	**If OK, Initial**
Warm tire pressure (psi): Front 90 Middle N/A Rear 92	B.L.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°(-1°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	B.L.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 9910	Manufacturer: Glaval	Date: 6-17-99
Run Number: 1	Personnel: B.L, S.C. and R.H.	
Test Direction: ☐CW or ☒CCW	Temperature (°F): 61	Humidity (%): 52
SLW (lbs): 13,750	Wind Speed (mph) & Direction: N / 5	Barometric Pressure (in.Hg): 30.33

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:41	8:41	22.8	95.20	93.40	1.80
ART #1	0	4:00	4:00	23.3	93.40	91.50	1.90
CBD #2	0	8:43	8:43	23.8	91.50	89.65	1.85
ART #2	0	4:02	4:02	25.0	89.65	87.85	1.80
CBD #3	0	8:46	8:46	25.3	87.85	86.00	1.85
COMMUTER	0	5:54	5:54	25.8	86.00	83.95	2.05
							Total Fuel = 11.25 lbs

20 minute idle : Total Fuel Used = 1.00 lbs

Heating Value = 20,214.0 BTU/LB

Comments:

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 9910	Manufacturer: Glaval	Date: 6-17-99
Run Number: 2	Personnel: B.L., S.C. and R.H.	
Test Direction: ☒CW or ☐CCW	Temperature (°F): 66	Humidity (%): 50
SLW (lbs): 13,730	Wind Speed (mph) & Direction: NW / 7	Barometric Pressure (in.Hg): 30.29

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:56	8:56	28.1	83.95	82.10	1.85
ART #1	0	4:04	4:04	28.4	82.10	80.45	1.65
CBD #2	0	9:00	9:00	28.6	80.45	78.70	1.75
ART #2	0	4:06	4:06	29.2	78.70	77.05	1.65
CBD #3	0	8:59	8:59	29.5	77.05	75.25	1.80
COMMUTER	0	5:56	5:56	29.3	75.25	73.25	2.00
							Total Fuel = 10.70 lbs

20 minute idle: Total Fuel Used = N/A

Heating Value = 20,214.0 BTU/LB

Comments:

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 9910	Manufacturer: Glaval	Date: 6-22-99
Run Number: 3	Personnel: B.L., R.H. and C.S.	
Test Direction: ☐CW or ☐CCW	Temperature (°F): 78	Humidity (%): 42
SLW (lbs): 13,730	Wind Speed (mph) & Direction: Calm	Barometric Pressure (in.Hg): 30.15

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:40	8:40	30.5	79.05	77.25	1.80
ART #1	0	3:56	3:56	31.1	77.25	75.60	1.65
CBD #2	0	8:32	8:32	32.0	75.60	73.85	1.75
ART #2	0	3:52	3:52	33.2	73.85	72.15	1.70
CBD #3	0	8:34	8:34	33.7	72.15	70.35	1.80
COMMUTER	0	5:52	5:52	33.9	70.35	68.35	2.00
							Total Fuel = 10.70 lbs

20 minute idle: Total Fuel Used = N/A

Heating Value = 20,214.0 BTU/LB

Comments:

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 9910	Manufacturer: Glaval	Date: 6-22-99
Run Number: 4	Personnel: B.L., R.H. and C.S.	
Test Direction: ☒CW or ☐CCW	Temperature (°F): 80	Humidity (%): 40
SLW (lbs): 13,730	Wind Speed (mph) & Direction: 3 / N	Barometric Pressure (in.Hg): 30.17

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:42	8:42	34.1	68.45	66.60	1.85
ART #1	0	3:55	3:55	34.3	66.60	64.95	1.65
CBD #2	0	8:48	8:48	34.7	64.95	63.15	1.80
ART #2	0	3:56	3:56	35.1	63.15	61.50	1.65
CBD #3	0	8:40	8:40	35.8	61.50	59.75	1.75
COMMUTER	0	5:54	5:54	36.1	59.75	57.65	2.10
							Total Fuel = 10.80 lbs

20 minute idle : Total Fuel Used = 0.85 lbs

Heating Value = 20,214.0 BTU/LB

Comments:

FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER :GLAVAL BUS NUMBER :9910
BUS MODEL :UNIVERSAL TEST DATE :6/17/99

FUEL TYPE : DIESEL
SP. GRAVITY : .8095
HEATING VALUE : 20214.00 BTU/Lb
Standard Conditions : 60 deg F and 14.7 psi
Density of Water : 8.3373 lb/gallon at 60 deg F

CYCLE	TOTAL FUEL USED (Lb)	TOTAL MILES	FUEL ECONOMY M/Lb(Measured)	FUEL ECONOMY MPG(Corrected)
Run # :1, CCW				
CBD	5.50	5.73	1.04	6.53
ART	3.70	3.82	1.03	6.47
COM	2.05	3.82	1.86	11.68
TOTAL	11.25	13.37	1.19	7.45
Run # :2, CW				
CBD	5.40	5.73	1.06	6.65
ART	3.30	3.82	1.16	7.26
COM	2.00	3.82	1.91	11.97
TOTAL	10.70	13.37	1.25	7.83
Run # :3, CCW				
CBD	5.35	5.73	1.07	6.71
ART	3.35	3.82	1.14	7.15
COM	2.00	3.82	1.91	11.97
TOTAL	10.70	13.37	1.25	7.83
Run # :4, CW				
CBD	5.40	5.73	1.06	6.65
ART	3.30	3.82	1.16	7.26
COM	2.10	3.82	1.82	11.40
TOTAL	10.80	13.37	1.24	7.76

IDLE CONSUMPTION

First 20 Minutes Data : 1.00 Lb Last 20 Minutes Data : .85 Lb
Average Idle Consumption : 2.78 Lb/Hr

RUN CONSISTENCY: % Difference from overall average of total fuel used

Run 1 : -3.6 Run 2 : 1.5 Run 3 : 1.5 Run 4 : .6

SUMMARY

Average Idle Consumption : .44 G/Hr
Average CBD Phase Consumption : 6.64 MPG
Average Arterial Phase Consumption : 7.03 MPG
Average Commuter Phase Consumption : 11.76 MPG
Overall Average Fuel Consumption : 7.72 MPG
Overall Average Fuel Consumption : 56.57 Miles/ Million BTU

7. NOISE

7.1 INTERIOR NOISE AND VIBRATION TESTS

7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level will be measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system shall provide a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories will be switched off and all openings including doors and windows will be closed. This test will be performed at the ABTC.

2. The bus accelerating at full throttle from a standing start to 35 mph on a level pavement. All openings will be closed and all accessories will be operating during the test. This test will be performed at the Test Track Facility.

3. The bus will be operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles will be noted. This test will be performed on the test segment between the Test Track Facility and the ABTC.

All tests will be performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions will be recorded in the test data.

7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 46.6 dB(A); ranging from 45.6 dB(A) in line with the middle speaker to 47.4 dB(A) at the driver's seat. The interior ambient noise level for this test was 49.0 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 73.6 dB(A) at the rear passenger seats to 77.0 dB(A) at the driver's seat. The overall average was 75.4 dB(A). The interior ambient noise level for this test was 34.0 dB(A).

The third part of the test is to listen for resonant vibrations, rattles, and other noise sources while operating over the road. No vibrations or rattles were noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise

Bus Number: 9910	Date: 5-11-99
Personnel: S.C. and G.S	
Temperature (°F): 68	Humidity (%): 35
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 29.98	
Initial Sound Level Meter Calibration: ☒ checked by B.L.	
Interior Ambient Noise Level dB(A): 49.0	Exterior Ambient Noise Level dB(A): 53.7
Microphone Height During Testing (in): 45	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	47.4
Front Passenger Seats	47.4
In Line with Front Speaker	46.3
In Line with Middle Speaker	45.6
In Line with Rear Speaker	46.0
Rear Passenger Seats	46.6

Final Sound Level Meter Calibration: ☒ checked by B.L.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	
Temperature (°F): 70	Humidity (%): 53
Wind Speed (mph): 9	Wind Direction: S
Barometric Pressure (in.Hg): 30.19	
Initial Sound Level Meter Calibration: ☒ checked by B.L.	
Interior Ambient Noise Level dB(A): 34.0	Exterior Ambient Noise Level dB(A): 39.9
Microphone Height During Testing (in): 45	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	77.0
Front Passenger Seats	76.4
Middle Passenger Seats	74.5
Rear Passenger Seats	73.6

Final Sound Level Meter Calibration: ☒ checked by B.L.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., S.C. and R.H.	
Temperature (°F): 70	Humidity (%): 53
Wind Speed (mph): 9	Wind Direction: S
Barometric Pressure (in.Hg): 30.19	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location
Engine and Accessories	None noted.
Windows and Doors	None noted.
Seats and Wheel Chair lifts	None noted.

Comment on any other vibration or noise source which may have occurred that is not described above: None noted.

7.1 INTERIOR NOISE TEST

TEST BUS SET-UP FOR INTERIOR NOISE TEST

7.2 EXTERIOR NOISE TESTS

7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed at or below 35 mph and just prior to transmission upshift.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide open throttle.

In addition, the buses will be tested with and without the air conditioning and all accessories operating. The exterior noise levels will be recorded.

The test site is at the Test Track Facility and the test procedures will be in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus will measure the noise level.

During the test, special attention should be paid to:

1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
2. Proper usage of all test equipment including set-up and calibration
3. The ambient sound level

7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions and at stationary low and high idle, with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an exterior ambient noise level of 38.0 dB(A), the average test result obtained while accelerating from a constant speed was 74.0 dB(A) on the right side and 73.8 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 39.2 dB(A), the average of the results obtained were 75.6 dB(A) on the right side and 74.3 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 61.6 dB(A) at low idle and 76.4 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged .09 dB(A) lower at low idle, and 1.1 dB(A) lower at wide open throttle. The exterior ambient noise level measured during this test was 39.7 dB(A). Note: the test vehicle was not equipped with a fast idle mode, therefore, data for that condition is not available.

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	
Temperature (°F): 78	Humidity (%): 47
Wind Speed (mph): 5	Wind Direction: SW
Barometric Pressure (in.Hg): 30.22	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ☒ checked by B.L.	
Initial Sound Level Meter Calibration: ☒ checked by B.L.	
Exterior Ambient Noise Level dB(A): 38.0	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	73.6	1	73.5
2	74.0	2	73.6
3	73.5	3	73.4
4	73.9	4	73.6
5	73.2	5	74.0
Average of two highest actual noise levels = 74.0 dB(A)		Average of two highest actual noise levels = 73.8 dB(A)	

Final Sound Level Meter Calibration Check: ☒ checked by B.L.
Comments:

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	
Temperature (°F): 78	Humidity (%): 47
Wind Speed (mph): 5	Wind Direction: SW
Barometric Pressure (in.Hg): 30.22	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ☒ checked by B.L.	
Initial Sound Level Meter Calibration: ☒ checked by B.L.	
Exterior Ambient Noise Level dB(A): 39.2	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	76.0	1	73.9
2	75.2	2	73.2
3	73.5	3	73.4
4	73.4	4	73.2
5	73.6	5	74.6
Average of two highest actual noise levels = 75.6 dB(A)		Average of two highest actual noise levels = 74.3 dB(A)	

Final Sound Level Meter Calibration Check: ☒ checked by B.L.
Comments:

EXTERIOR NOISE TEST DATA FORM
Stationary

Bus Number: 9910	Date: 6-23-99
Personnel: B.L., C.S. and R.H.	
Temperature (°F): 78	Humidity (%): 47
Wind Speed (mph): 5	Wind Direction: SW
Barometric Pressure (in.Hg): 30.22	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ☒ checked by B.L.	
Initial Sound Level Meter Calibration: ☒ checked by B.L.	
Exterior Ambient Noise Level dB(A): 39.7	

Accessories and Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	668	61.6	61.6
High Idle	N/A	N/A	N/A
Wide Open Throttle	3,602	77.5	75.2

Accessories and Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Actual
Low Idle	670	61.0	60.4
High Idle	N/A	N/A	N/A
Wide Open Throttle	3,622	76.2	74.3

Final Sound Level Meter Calibration Check: ☒ checked by B.L.
Comments:

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CERTIFICATE

The Certification Body of TÜV SÜD AMERICA INC.

hereby certifies that

Glaval Bus
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Glaval Bus
914 County Rd #1 N
Elkhart, IN 46514 USA
(see page 2 for additional locations)

has implemented a Quality Management System in accordance with:

ISO 9001:2015

The scope of this Quality Management System includes:

Design and Manufacture of Shuttle Buses

Certificate Expiry Date: December 8, 2019

Certificate Registration No: 951 07 4532

Effective Date: May 3, 2018

TÜV SÜD ISO 9001

Mark Alpert
Vice President, Business Assurance

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Scope – Design and Manufacture of Shuttle Buses

Processes – Purchasing, Engineering, Sales, Receiving, Inspection, Production, Shipping, Service and Warranty, Leadership and Management, Internal Audits

Glaval Bus
55135 CR#1
Elkhart, IN 46514 USA

Scope – Final Inspection on Mid-Sized Buses to Individually Designed Customer Specifications

Processes – Inspection, Testing, Alignment, Undercoating, Graphics, Gig Sheet Correction

Certificate Expiry Date: December 8, 2019

Certificate Registration No: 951 07 4532

Effective Date: May 3, 2018

ISO 9001

Mark Alpert
Vice President, Business Assurance

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REQUEST FOR QUOTATION
EXHIBIT A PRICING PAGE
176" - 190" Wheelbase Cutway Vehicle

VENDOR NAME:

MANUFACTURER/MAKE/MODEL:

CLASS	VEHICLE DESCRIPTION	UNIT PRICE PER VEHICLE	ESTIMATED QUANTITY	EXTENDED PRICE
A	176" Vehicle, Eight (8) Fixed Double Seats, Two (2) Wheelchair Positions with One (1) Fold Up Seat (Double), Rear Curbside Lift Location, Vinyl Logo and Stripes	$ 80,867.00	5	$ 404,335.00
B	176" Vehicle, Eight (8) Fixed Double Seats, Two (2) Wheelchair Positions with One (1) Fold Up Seat (Double), Rear Curbside Lift Location, Full Bus Body Paint or 3/4 Bus Body Paint with Expanded Graphics	$ 83,926.00	5	$ 419,630.00
C	Vehicle, Seven (7) Fixed Double Seats, Two (2) Wheelchair Positons with Two (2) Fold Up Seats (Double), Extended Wheelbase to 190", Front Wheel Chair Lift Location, Vinyl Logo and Stripes	$ 81,604.00	5	$ 408,020.00
D	Vehicle, Seven (7) Fixed Double Seats, Two (2) Wheelchair Positons with Two (2) Fold Up Seats (Double), Extended Wheelbase to 190", Front Wheel Chair Lift Location, Full Bus Body Paint or 3/4 Bus Body Paint with Expanded Graphics	$ 84,664.00	5	$ 423,320.00
E	Vehicle, Seven (7) Fixed Double Seats, Two (2) Wheelchair Positons with Two (2) Fold Up Seats (Double), Extended Wheelbase to 190", Front Wheel Chair Lift Location, Vinyl Logo and Stripes, Overhead Luggage Racks, High Back Seats	$ 81,736.00	5	$ 408,680.00
F	Vehicle, Seven (7) Fixed Double Seats, Two (2) Wheelchair Positons with Two (2) Fold Up Seats (Double), Extended Wheelbase to 190", Front Wheel Chair Lift Location, Full Bus Body Paint or 3/4 Bus Body Paint with Expanded Graphics Overhead Luggage Racks, High Back Seats	$ 84,796.00	5	$ 423,980.00
	TOTAL BID FOR EVALUATION			$ 2,487,965.00

***Complete form provided. The DPT may purchase more or less as needed.**

Note: These are only estimated quantities and do not reflect any guarantee of purchase.

Please do not alter pricing page.

REQUEST FOR QUOTATION
EXHIBIT A PRICING PAGE
176" - 190" Wheelbase Cutway Vehicle

VENDOR NAME:
MANUFACTURER/MAKE/MODEL:

REQUEST FOR QUOTATION
EXHIBIT A PRICING PAGE
176" - 190" Wheelbase Cutway Vehicle

VENDOR NAME:
MANUFACTURER/MAKE/MODEL:

DOCUMENTATION TO BE SUBMITTED WITH BID:

Section Referenced	
✓ 3.1.11	Provide details of water testing procedures.
✓ 3.2	Chassis: provide product description, warranty information and product literature.
✓ 3.2	Wheelbase: provide length of proposed wheelbase.
✓ 3.3	Engine: gasoline: provide product description, warranty information and product literature.
✓ 3.5	Radiator and Cooling System: provide product description, warranty information and product literature.
✓ 3.6	High Idle System, provide product description, warranty information and product literature.
✓ 3.8	Transmission: provide product description, warranty information and product literature.
✓ 3.10.4	Rear View Back-Up Camera: provide product description, warranty information and literature.
✓ 3.11.4	Tilt Wheel, Cruise Control and Power Steering: provide product description.
✓ 3.13	Brakes: provide product description, warranty information and product literature.
✓ 3.14	Wheels: provide product description, warranty information and product literature.
✓ 3.15	Tires: provide product description, warranty information and product literature.
✓ 3.16.5	Alternator: provide product description, warranty information and product literature.
✓ 3.16.6	Battery: provide product description, warranty information and product literature.
✓ 3.17.1	Radio/AM/FM/USB/MP3: provide product description, warranty information and product literature.
✓ 3.19	Body Structure/Roof Specifications: provide a description of how construction/ conversion will take place and meet the specification requirements. Provide actual interior height and body length of proposed vehicle.
✓ 3.19.15	Stepwell: provide a description of construction.
✓ 3.22	Entrance, Exit, Lift and Emergency Exit Doors: Provide product description, dimensions, description of connection with interlock system, and locks to be provided.

✓ 3.23	Rear Bumper: provide product description, warranty information and product literature.
✓ 3.24	Wheelchair Lift: provide product description, warranty information and product literature.
✓ 3.24.9	Interlock System: provide product description, warranty information and product literature.
✓ 3.26	Front and Rear Heating and Air Conditioning: provide product description, warranty information, product literature.
✓ 3.29	Flooring: provide a description of product to be used, samples of floor covering, colors to be used and assembly process.
✓ 3.30.1	Passenger Seats and Restraints: provide product description, warranty information and product literature.
✓ 3.30.2	Padded Grab Handle: provide product description.
✓ 3.30.11	Driver's Seat: provide product description, warranty information and product literature.
✓ 3.31	Wheelchair Securement System: provide product description, warranty information and product literature.
✓ 3.32	Mobility Aid/ Occupant Restraint Systems: provide product description, warranty information and product literature.
✓ 3.33.1	Exterior Mirrors: provide product description, warranty information and product literature.
✓ 3.37	Digital Destination Signs: provide product description, warranty information and product literature.
✓ 3.38	Passenger Signaling System: provide product description, warranty information and product literature.
✓ 3.39	Mobile PA System: provide product description, warranty information and product literature.
✓ 3.40	Fare Box Provision: provide description of provision.
✓ 3.41	Strobe Light: provide product description, warranty information and product literature.
✓ 3.42	Radio Install Prep: provide description of process.
✓ 3.44	Security Camera System Including Playback: provide product description, warranty information and product literature.

✓	3.45	Dual Purpose Safety Vent: provide product description, warranty information and product literature.
✓	3.46	Storage Compartment: provide information on proposed location.
✓	3.51	Training: submit letter of understanding to the terms in this Section.
✓	4.5-4.6	Overhead Luggage Rack: provide product description and product literature. Classes E&F
✓	4.5-4.6	High Back Passenger Seating: provide product description, warranty information and product literature. Classes E & F
✓	6.7.4	Warranty Provider Locations: provide names of providers in WV.
✓	6.7.5	Warranties: provide information on warranties to be provided.
✓	11.1.1	Complete mechanical description of vehicle, its construction and equipment including manufacturer's model name and/or number.
✓	11.1.2	Proposed interior floor plans, showing detailed dimensions including the location of the wheelchair securement system.
✓	11.1.3	Curb weight (empty weight) and gross vehicle weight rating (GVWR of vehicle.
✓	11.1.6	Rustproofing and Undercoating: provide product description, warranty information and product literature.
✓	11.1.8	A list of five (5) users names, addresses, emails and telephone numbers who have been provided similar equipment.

✓	No Debt Affidavit
✓	Addendum Acknowledgement

2018 E-Series Cutaway E-450 DRW

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Seating for
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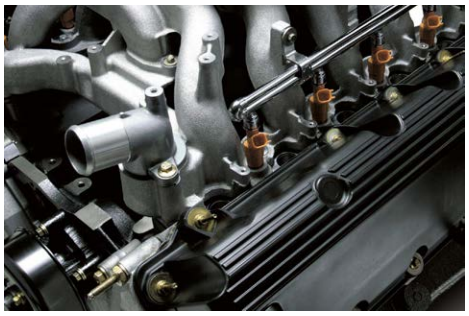
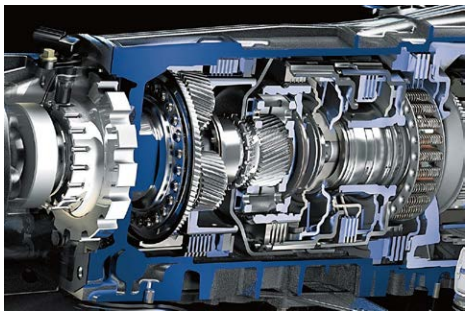
Key Features



6.8L EFI Triton® V10 engine with 6-speed Automatic Transmission

Featuring a brawny 305 horsepower and best-in-class gas torque* of 420 lb.-ft., the standard Ford-built 6.8L Triton® V10 is engineered to generate the raw power required for the heavy-duty hauling and towing applications typical of Class 3–4 cutaway chassis. The 6.8L V10 is coupled with the TorqShift® 6-speed automatic transmission, also Ford-built, which includes a selectable tow/haul mode that automatically compensates for altitude, grade and load conditions.



TorqShift® 6-Speed Automatic Overdrive with Tow/Haul Mode

The TorqShift® 6-speed automatic transmission is designed and built by Ford to handle the high-performance demands of the standard 6.8L Triton® V10 (305 horsepower and 420 lb.-ft. torque) and the available 6.2L flex-fuel V8 (331 horsepower and 356 lb.-ft. or torque). The TorqShift has Tow/Haul mode. On an uphill, it selects the gear that minimizes gear hunting; on a downhill, it prevents upshifting and increase in speed, reducing reliance on brake pressure to slow down.

16-inch x 6-inch White-Painted Steel Wheels

These white-painted wheels are standard on DRW models.

*Class is Full-Size Vans based on Ford segmentation.

Exterior Features

Interior Features

Packages

Power and Handling

Safety

Specifications

Exterior Dimensions

	E-350 Super Duty® Cutaway (SRW)	E-350 Super Duty® Cutaway (SRW)	E-350 Super Duty® Cutaway (DRW)	E-350 Super Duty® Cutaway (DRW)	E-350 Super Duty® Cutaway (DRW)	E-450 Super Duty® Cutaway (DRW)	E-450 Super Duty® Cutaway (DRW)
Wheelbase (in.)	138	158	138	158	176	158	176
Overall Length (in.)	241.1	261.1	241.1	261.1	261.1	261.1	261.1
Overall Height (Loaded) (in.)	80.4	80.3	80.3	80.2	80.1	80	80
Overall Width (in.)	79.4	79.4	94.9	94.9	94.9	94.9	94.9
Front Track (in.)	69.4	69.4	69.4	69.4	69.4	69.4	69.4
Rear Track (in.)	72.1	72.1	75.4	75.4	75.4	77.7	77.7

Cab Length (in.)	**92.5**	**92.5**	**92.5**	**92.5**	**92.5**	**92.5**	**92.5**
Cab Rear to Rear Axle	**80**	**100**	**80**	**100**	**118**	**100**	**118**
Top of Frame to Top of Cab (in.)	**54.4**	**54.4**	**54.4**	**54.4**	**54.4**	**58.4**	**58.4**
Rear Axle to End of Frame (in.)	**68.5**	**68.5**	**68.5**	**68.5**	**50.5**	**68.5**	**50.5**
Load Height (loaded) (in.)	**25.9**	**25.9**	**26.2**	**26.2**	**26.2**	**26**	**26**
Front Overhang (in.)	**34.6**	**34.6**	**34.6**	**34.6**	**34.6**	**34.6**	**34.6**
Estimated base Curb Weight (lbs.)	**4812 lbs. (6.2L)/4864 lbs. (6.8L)**	**4852 (6.2L)/4928 (6.8L)**	**5079 (6.2L)/5136 (6.8L)**	**11,500 lb GVWR 5127 lb/12500 GVWR 5163 (6.2L) / 11,500 GVWR 5214/12500 GVWR 5155(6.8L)**	**5182 (6.2L)/5237 (6.8L)**	**5369 (6.2L)/14200 GVWR 5446/14500 GVWR 5407 (6.8L)**	**5383 (6.2L)/ 14200 GVWR 5477/14500 GVWR 5435 (6.8L)**

Interior Dimensions

	E-350 Super Duty® Cutaway (SRW) / (DRW)	E-450 Super Duty® Cutaway (DRW)
First row Head Room (in.)	**42**	**42**
First row Shoulder room (in.)	**68.1**	**68.1**
First row Hip Room (in.)	**65.6**	**65.6**
First row max. Leg Room (in.)	**42.1**	**42.1**

Capacities: Passengers, Fuel

	E-350 Super Duty® Cutaway (SRW) / (DRW)	E-450 Super Duty® Cutaway (DRW)
Seating capacity (std./opt.)	**1.2**	**1.2**
Fuel capacity (gal.)	**40/55**	**40/55**

Engine Specifications

Engine type	6.8L Triton® 2-valve V10	6.2L Triton® V8 FFV
Engine electronics	**EEC-V computer**	
Displacement	**415 CID**	
Horsepower (SAE net@rpm)	**305@4,250**	**331@5,500**
Torque (lb.-ft. @rpm)	**420@3,250**	**356@4,000**
Compression ratio	**9.06:1**	**9.8:1**
Bore x stroke (in.)	**3.55x4.16**	**4.02x3.74**
Main bearings	**6-bearing**	
Valvetrain	**SOHC, 2 valves per cylinder**	**SOHC, 2 valves per cylinder**
Valve lifters	**Hydraulic roller finger**	**Roller-rocker shafts**
Fuel delivery	**Sequential multiport electronic fuel injection (SEFI)**	**Sequential multiport electronic fuel injection (SEFI)**
Electronic throttle control (ETC)	**Std**	**Std**
Engine oil cooler	**Std**	**Std**
Recommended fuel	**Unleaded regular**	**Unleaded Regular or E85(1) ; bi-fuel capable CNG or propane autogas (requires upfit)**
Exhaust	**LH-Cast Iron, RH-Stainless Steel**	
Transmission type	**TorqShift® 6-speed automatic overdrive w/Tow Haul**	**TorqShift® 6-speed automatic overdrive w/Tow Haul**
Engine block material	**Cast iron**	**Cast iron**
Cylinder head material	**Aluminum**	**8 Aluminum heads**

(1) Restrictions

apply

Chassis Specifications

Front suspension	**Twin I-beam IFS with computer-selected coil springs and stabilizer bar**
Rear suspension	**Multileaf 2-stage leaf springs/solid axle and rear stabilizer bar (DRW only)**
Front and rear shocks	**Heavy-duty gas-pressurized**
Brakes	**Power 4-wheel disc anti-lock**
Steering	**Recirculating ball, power assisted**

Maximum Payloads

CUTAWAY	Engine	GCWR	GVWR	Payload
E-350 (SRW) 138" Wheelbase	**6.8L**	**18500**	**10050**	**5180**
E-350 (SRW) 138" Wheelbase	**6.2L**	**13000**	**10050**	**5230**
E-350 (DRW) 138" Wheelbase	**6.8L**	**18500**	**11500**	**6360**

E-350 (DRW) 138" Wheelbase	**6.2L**	**13000/17000**	**11500**	**6420**
E-350 (SRW) 158" Wheelbase	**6.8L**	**18500**	**10050**	**5120**
E-350 (SRW) 158" Wheelbase	**6.2L**	**13000**	**10050**	**5190**
E-350 (DRW) 158" Wheelbase	**6.8L**	**18500**	**11500**	**6280**
E-350 (DRW) 158" Wheelbase	**6.2L**	**13000**	**11500**	**6370**
E-350 (DRW) 158" Wheelbase	**6.8L**	**18500**	**12500**	**7340**
E-350 (DRW) 158" Wheelbase	**6.2L**	**13000**	**12500**	**7330**
E-350 (DRW) 176" Wheelbase	**6.8L**	**18500**	**12500**	**7560**
E-350 (DRW) 176" Wheelbase	**6.2L**	**13000/17000**	**12500**	**7310**
E-450 (DRW) 158" Wheelbase	**6.2L**	**18000**	**14000**	**8630**
E-450(DRW) 176" Wheelbase	**6.2L**	**18000**	**14000**	**8610**
E-450 (DRW) 158" Wheelbase	**6.8L**	**22000**	***14200/14500**	**8750/9090**
E-450(DRW) 176" Wheelbase	**6.8L**	**22000**	***14200/14500**	**8720/9060**
*14200 lb GVWR optional (derated springs)				

Fuel Capacity and Engine Highlights

Engine Type	**6.8L Triton® 20-valve V10**	**6.2L V8 FFV**
Fuel Capacity	**40/55 gallons**	**40/55 gallons**

Vehicle Highlights

Drive Type	4x2	4x2
Transmission	**TorqShift® 6-speed automatic overdrive**	**TorqShift® 6-speed automatic overdrive**
Wheelbase	**138" (E-350 SRW/DRW)**	**138" (E-350 SRW/DRW)**
	158" (E-350 SRW/DRW, E-450 DRW)	**158" (E-350 SRW/DRW, E-450 DRW)**
	176" (E-350, E-450 DRW)	**176" (E-350, E-450 DRW)**
Maximum GVWR Range	**10,050 lbs. to 14,500 lbs.**	**10,050 lbs. to 14,000 lbs.**
Warranty	**Bumper to Bumper: 3 years / 36,000 miles**	**Bumper to Bumper: 3 years / 36,000 miles**
	Powertrain: 5 years / 60,000 miles	**Powertrain: 5 years / 60,000 miles**
	Safety Restraint System: 5 years / 60,000 miles	**Safety Restraint System: 5 years / 60,000 miles**
	Corrosion (Perforation Only): 5 years / Unlimited miles	**Corrosion (Perforation Only): 5 years / Unlimited miles**
	Roadside Assistance Program: 5 years / 60,000 miles	**Roadside Assistance Program: 5 years / 60,000 miles**

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2018 E-Series Cutaway

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1. Contact your Sales Representative or Service Advisor at your selling/servicing dealership.

2. If your inquiry or concern remains unresolved, contact the Sales Manager, Service Manager or Customer Relations Manager.

3. If you require assistance or clarification on Ford Motor Company policies or procedures, please contact the Ford Customer Relationship Center.

In the United States:	**In Canada:**
Ford Motor Company Customer Relationship Center P.O. Box 6248 Dearborn, MI 48121 1-800-392-3673 (FORD) (TDD for the hearing impaired: 1–800-232-5952) www.customersaskford.com	Customer Relationship Centre Ford Motor Company of Canada, Limited P.O. Box 2000 Oakville, Ontario L6J 5E4 1–800-565-3673 (FORD) www.ford.ca
In Asia-Pacific Region, Sub-Saharan Africa, U.S. Virgin Islands, Central America, the Caribbean, and Israel:	**In Puerto Rico:**
Ford Motor Company Ford Export Operations Attention: Customer Relations 1555 Fairlane Drive Fairlane Business Park #3 Allen Park, MI 48101 Telephone: (313) 594-4857 For customers in Guam, the Commonwealth of the Northern Mariana Islands (CNMI), America Samoa, and the U.S. Virgin Islands, please feel free to call our Toll-Free Number: (800) 841-FORD (3673) Fax: (313) 390-0804 E-mail: expcac@ford.com	Ford International Business Development, Inc. P.O. Box 11957 Caparra Heights Station San Juan, PR 00922-1957 Telephone: (800) 841-FORD (3673) Fax: (313) 390-0804 E-mail: prcac@ford.com www.ford.com.pr
In Middle East:	
Ford Middle East Customer Relationship Center P.O. Box 21470 Dubai, United Arab Emirates Telephone: 971-4-3326084 Toll-free Number for the Kingdom of Saudi Arabia: 800 8971409 Local Telephone Number for Kuwait: 24810575 Fax: 971-4-3327299 E-mail: menacac@ford.com www.me.ford.com	

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1. Introduction

Ford Motor Company and your selling dealer thank you for selecting one of our quality products. Our commitment to you and your vehicle begins with quality protection and service.

When you need warranty repairs, your selling dealer would like you to return to it for that service, but you may also take your vehicle to another Ford Motor Company dealership authorized for warranty repairs. Certain warranty repairs require special training though, so not all dealers are authorized to perform all warranty repairs. That means that, depending on the warranty repair needed, the vehicle may need to be taken to another dealer. If a particular dealership cannot assist you, then contact the Customer Relationship Center at 1-800-392-3673.

This booklet explains in detail the warranty coverages that apply to your 2016-model car or light truck. If you bought a previously owned 2016-model vehicle, you are eligible for any remaining warranty coverages.

Ford Motor Company provides the **Emissions Defect Warranties** and **Emissions Performance Warranties** which cover your emissions control systems, and **Noise Emissions Warranty** which applies only to medium/heavy duty trucks over 10,000 pounds Gross Vehicle Weight Rating (pages 17-32).

2. Important information you should know

IF YOU NEED CUSTOMER ASSISTANCE

Your Ford Motor Company dealer is available to assist you with all your automotive needs. Please follow the procedures outlined on the front page of this booklet.

In addition, if you are an eligible U.S. owner, you may use - at no cost - the services of the BBB AUTO LINE program. For details, see Better Business Bureau (BBB) AUTO LINE program, page 34 or call 1-800-955-5100.

KNOW WHEN YOUR WARRANTY BEGINS

Your **Warranty Start Date** is the day you take delivery of your new vehicle or the day it is first put into service (for example, as a dealer demonstrator), whichever occurs first.

CHECK YOUR VEHICLE

We try to check vehicles carefully at the assembly plant and the dealership, and we usually correct any damage to paint, sheet metal, upholstery, or other appearance items. But occasionally something may slip past us, and a customer may find that a vehicle was damaged before he or she took delivery. If you see any damage when you receive your vehicle, notify your dealership within one week.

MAINTAIN YOUR VEHICLE PROPERLY

Your glove compartment contains an **Owner's Manual** which indicates the scheduled maintenance required for your vehicle. Proper maintenance guards against major repair expenses resulting from neglect or inadequate maintenance, may help increase the value you receive when you sell or trade your vehicle, and is important in allowing your vehicle to comply with applicable emissions standards.

It is your responsibility to make sure that all of the scheduled maintenance is performed and that the materials used meet Ford engineering specifications. Failure to perform scheduled maintenance as specified in the Owner's Manual will invalidate warranty coverage on

parts affected by the lack of maintenance. Make sure that receipts for completed maintenance work are retained with the vehicle and confirmation of maintenance work is always entered in your **Owner's Manual**.

Your Ford or Lincoln dealership, or Ford or Lincoln Auto Care Service Center, has factory-trained technicians who can perform the required maintenance using genuine Ford parts. The dealership looks forward to meeting your every service need to maximize your satisfaction with your vehicle.

WHO PAYS FOR WARRANTY REPAIRS?

You will not be charged for repairs covered by any applicable warranty during the stated coverage periods, unless specifically stated elsewhere in this guide.

Some states have mandated alternate time coverage periods for parts of your vehicle (e.g. seatbelts).

Some states and/or local governments may require a tax on a portion of warranty repairs. Where applicable law allows, the tax must be paid by you, the owner of the vehicle.

During the Bumper to Bumper Warranty period, dealers may receive instructions to provide no-cost, service-type improvements - not originally included in your Owner's Manual - intended to increase your overall satisfaction with your vehicle.

Sometimes Ford may offer a special adjustment program to pay all or part of the cost of certain repairs beyond the terms of the applicable warranty. Check with your dealer or call 1-800-392-3673 to learn whether any adjustment program is applicable to your vehicle. Please have your vehicle identification number available.

DO WARRANTIES APPLY IN OTHER COUNTRIES?

The **New Vehicle Limited Warranty** and the **Emissions Warranties** described in this booklet apply to your vehicle if:

- it was originally purchased through the Ford Export Operations Military Sales Program; or
- it was originally sold or leased by Ford Motor Company or one of its dealers in the United States or U.S. Federalized Territories, and it was originally registered/licensed and operated in the United States, U.S. Federalized Territories, or Canada.

If you meet either of these two requirements, you do have warranty coverage when you travel with this vehicle outside the United States, U.S. Federalized Territories, or Canada. In some cases, however, you may have to pay the servicing Ford dealer in a foreign country or U.S. Federalized Territory for a repair that is covered under the U.S. warranty. If this happens, be sure to save the paid repair order or invoice. You should present this document to a U.S. Ford Motor Company dealer for warranty refund consideration. Refer to www.Ford.com for additional customer assistance reference information.

3. The New Vehicle Limited Warranty for your 2016-model vehicle

LIMITATIONS AND DISCLAIMERS

All of the warranties in this booklet are subject to the following limitations and disclaimers:

The warranties in this booklet are the only express warranties applicable to your vehicle. Ford does not assume or authorize anyone to assume for it any other obligation or liability in connection with your vehicle or these warranties. No person, including Ford employees or dealers, may modify or waive any part of these warranties.

Ford and its dealers reserve the right to make changes in or additions to vehicles built or sold by them at any time without incurring any obligation to make the same or similar changes or additions to vehicles previously built or sold.

Ford and its dealers also reserve the right to provide post-warranty repairs, conduct recalls, or extend the warranty coverage period for certain vehicles or vehicle populations, at the sole discretion of Ford. The fact that Ford has provided such measures to a particular vehicle or vehicle population in no way obligates Ford to provide similar accommodations to other owners of similar vehicles.

As a condition of these warranties, you are responsible for properly using, maintaining, and caring for your vehicle as outlined in your Owner's Manual. Ford recommends that you maintain copies of all maintenance records and receipts for review by Ford.

Ford and your dealer are not responsible for any time or income that you lose, any inconvenience you might be caused, the loss of your transportation or use of your vehicle, the cost of rental vehicles, fuel, telephone, travel, meals, or lodging, the loss of personal or commercial property, the loss of revenue, or for any other incidental or consequential damages you may have.

Punitive, exemplary, or multiple damages may not be recovered unless applicable law prohibits their disclaimer.

You may not bring any warranty-related claim as a class representative, a private attorney general, a member of a class of claimants or in any other representative capacity.

Ford shall not be liable for any damages caused by delay in delivery or furnishing of any products and/or services.

You may have some implied warranties. For example, you may have an implied warranty of merchantability (that the car or light truck is reasonably fit for the general purpose for which it was sold) or an implied warranty of fitness for a particular purpose (that the car or light truck is suitable for your special purposes), if a special purpose was specifically disclosed to Ford itself not merely to the dealer before your purchase, and Ford itself not just the dealer told you the vehicle would be suitable for that purpose.

These implied warranties are limited, to the extent allowed by law, to the time period covered by the written warranties, or to the applicable time period provided by state law, whichever period is shorter.

These implied warranties do not apply at all if you use your vehicle for business or commercial purposes. In addition, the implied warranty of fitness for a particular purpose does not apply if your vehicle is used for racing, even if the vehicle is equipped for racing.

The warranties contained in this booklet and all questions regarding their enforceability and interpretation are governed by the law of the state in which you purchased your Ford vehicle. Some states do not allow Ford to limit how long an implied warranty lasts or to exclude or limit incidental or consequential damages, so the limitation and exclusions described above may not apply to you.

NOTE: This information about the limitation of implied warranties and the exclusion of incidental and consequential damages under the NEW VEHICLE LIMITED WARRANTY also applies to the EMISSIONS WARRANTIES described on pages 17-31.

Ford participates in the BBB AUTO LINE warranty dispute resolution program. You may contact BBB AUTO LINE by calling 800-955-5100.

You are required to submit your warranty dispute to the BBB AUTO LINE before exercising rights or seeking remedies under the Federal Magnuson-Moss Warranty Act, 15 U.S.C. § 2301 et seq. To the extent permitted by the applicable state "Lemon Law", you are also required to submit your warranty dispute to the BBB AUTO LINE before exercising any rights or seeking remedies under the "Lemon Law". If you choose to seek remedies that are not created by the Magnuson-Moss Warranty Act or the applicable state "Lemon Law," you are not required to first use BBB AUTO LINE to resolve your dispute – although the program is still available to you.

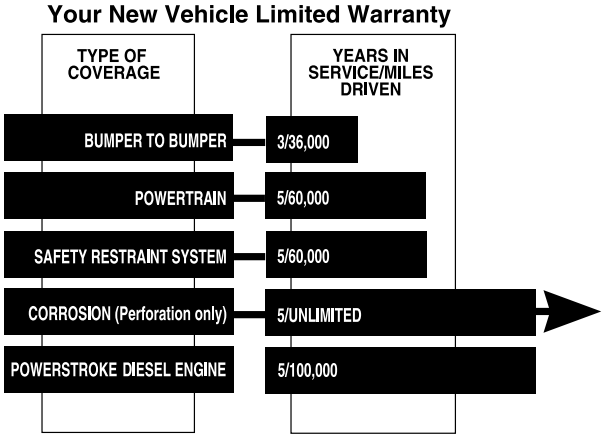
For more information regarding the BBB AUTO LINE program, see page 34 of this booklet.

QUICK REFERENCE: WARRANTY COVERAGE

This chart gives a general summary of your warranty coverage provided by Ford Motor Company under the **New Vehicle Limited Warranty.** Please refer to the description of warranty coverage for more specific information.

For each type of coverage, the chart shows two measures:

- years in service
- miles driven



The measure that occurs first determines how long your coverage lasts. For example: Your Bumper to Bumper Coverage lasts for three years - unless you drive more than 36,000 miles before three years elapse. In that case, your coverage ends at 36,000 miles.

For more details on coverage, see:

➡ **What is Covered?** (pages 8-12)
➡ **What is Not Covered?** (pages 12-15)

WHAT IS COVERED?

Your NEW VEHICLE LIMITED WARRANTY gives you specific legal rights. You may have other rights that vary from state to state. Under your New Vehicle Limited Warranty if:

- your Ford vehicle is properly operated and maintained, and

- was taken to a Ford dealership for a warranted repair during the warranty period,

then authorized Ford Motor Company dealers will, without charge, repair, replace, or adjust all parts on your vehicle that malfunction or fail during normal use during the applicable coverage period due to a manufacturing defect in factory-supplied materials or factory workmanship.

This warranty does not mean that each Ford vehicle is defect free. Defects may be unintentionally introduced into vehicles during the design and manufacturing processes and such defects could result in the need for repairs. For this reason, Ford provides the New Vehicle Limited Warranty in order to remedy any such defects that result in vehicle part malfunction or failure during the warranty period.

The remedy under this written warranty, and any implied warranty, is limited to repair, replacement, or adjustment of defective parts. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Ford, through its authorized dealers, is willing and able to repair, replace, or adjust defective parts in the prescribed manner. Ford's liability, if any, shall in no event exceed the cost of correcting manufacturing defects as herein provided and upon expiration of this warranty, any such liability shall terminate.

Conditions that are not covered by the New Vehicle Limited Warranty are described on pages 12-15. When making warranty repairs on your vehicle, the dealer will use Ford or Motorcraft parts or remanufactured or other parts that are authorized by Ford, at the discretion of Ford or the Ford dealership.

Nothing in this warranty should be construed as requiring defective parts to be replaced with parts of a different type or design than the original part, so long as the vehicle functions properly with the replacement part. Moreover, Ford and its authorized dealers are entitled to a reasonable time and a reasonable number of attempts within which to diagnose and repair any defect covered by this warranty.

In certain instances, Ford may authorize repairs at other than Ford dealer facilities.

Two separate warranties apply to tires on your new vehicle. The New Vehicle Limited Warranty covers tire defects in factory supplied material or workmanship for 100% of labor costs and on a pro rata adjustment basis for parts. (See the reimbursement schedule below).

For vehicles within the New Vehicle Limited Warranty time in service and mileage coverage period, defective tires will be replaced on a pro rata adjustment basis according to the following mileage-based Reimbursement Schedule:

MILES DRIVEN	PERCENT OF PARTS COVERED BY FORD
1-12,000	100%
12,001-24,000	60%
24,001-36,000	30%

The tire manufacturer also provides you with a separate tire warranty that may extend beyond the New Vehicle Limited Warranty coverage. You will find the manufacturer's tire warranty with the owner literature supplied with your vehicle. You have the option of having a tire warranty repair performed by the tire manufacturer's authorized service center. If you go to a tire service center for a repair covered by the New Vehicle Limited Warranty, you may be charged a prorated amount for wear or other charges. If so, you should present your paid invoice detailing the nature of the charges to any Ford Motor Company dealership for refund consideration. When making warranty repairs on your vehicle, the dealer will use Ford or Motorcraft parts or remanufactured or other parts that are authorized by Ford. In certain instances, Ford may authorize repairs at other than Ford dealer facilities. Tire replacements under warranty will be made with the same brand and model as originally equipped with the vehicle unless the same brand and model is no longer available, in which case a tire of the same brand, size, load, speed and tread type will be used. In some circumstances, Ford may authorize another brand and/or model to substitute for the original brand and model, even if still available.

Normal tire wear or damage is not reimbursable. See page 15 for details of what is not covered.

Extended warranty coverage periods are available for certain vehicle parts and conditions. Specifically,

(1) Your vehicle's Powertrain components are covered for five years or 60,000 miles, whichever occurs first. The extended coverage applies to the **Engine:** all internal lubricated parts, cylinder block, cylinder heads, electrical fuel pump, powertrain control module, engine mounts, flywheel, injection pump, manifold (exhaust and intake), manifold bolts, oil pan, oil pump, seals and gaskets, engine thermostat, engine thermostat housing, timing chain cover, timing chain (gears or belt), turbocharger/supercharger unit, valve covers, water pump;

Transmission: all internal parts, clutch cover, seals and gaskets, torque converter, transfer case (including all internal parts), transmission case, transmission mounts; **Front-Wheel Drive:** axle shafts, front bearings, seals and gaskets, universal and constant velocity joints; **Rear-Wheel Drive:** axle shafts, rear bearings, center support bearing, drive axle housing (including all internal parts), drive shaft, retainers, supports, seals and gaskets, universal and constant velocity joints.
Four-Wheel/All-Wheel Drive: axle shafts, bearings (front and rear), center support bearing, drive shafts, final drive housing (including all internal parts), hubs-automatic front locking (four-wheel drive), locking rings (four-wheel drive), seals and gaskets, universal and constant velocity joints.

(2) Your vehicle's safety belts and air bag Supplemental Restraint System (SRS) are covered for an extended Safety Restraint Coverage Period, which lasts for five years or 60,000 miles, whichever occurs first.

(3) Your vehicle's body sheet metal panels are covered for an extended Corrosion Coverage Period, which lasts for five years, regardless of miles driven. The extended warranty coverage only applies if a body sheet metal panel becomes perforated due to corrosion during normal use due to a manufacturing defect in factory-supplied materials or factory workmanship. If aluminum body panels have corrosion or rust damage, and the damage is not the result of abnormal usage, vehicle accident, customer actions and/or extreme environmental conditions, the corrosion or rust damage repairs are covered for 5 years, unlimited miles. For damage caused by airborne material (environmental fallout) where there is no factory-related defect involved and therefore no warranty – our policy is to provide free repair of paint damage due to the airborne material for 12 months or 12,000 miles, whichever occurs first.

(4) Your vehicle's direct injection diesel engine and certain engine components are covered during the PowerStroke Diesel Engine Coverage Period, which lasts for five years or 100,000 miles, whichever occurs first. The following parts are covered during this extended coverage period: the engine, cylinder block, heads and all internal parts, intake and exhaust manifolds, timing gear, harmonic balancer, valve covers, oil pan and pump, water pump, fuel system (excluding fuel lines, fuel tank and frame mounted fuel conditioning module sometimes referred to as the frame mounted pump/filter/water separator or frame mounted fuel filter/water separator), high pressure lines, gaskets and seals, glow plugs, turbocharger, two-stage turbocharger assembly, turbocharger actuator,

powertrain control module, high pressure fuel injection pump assembly, injectors, injection pressure sensor, fuel rail pressure sensor, exhaust back pressure regulator and sensor, exhaust pressure sensor, manifold pressure sensor, intake air temperature sensor, crankshaft position sensor, camshaft position sensor, accelerator switch.

NOTE: Some components may also be covered by the Emissions Warranties. For more information, see pages 17-31.

If you own or lease a 2016-model Next Generation Police Interceptor Vehicle (NGPI), refer to the Warranty Addendum Card that was given to you when you took delivery of your vehicle for further explanation of Amendments to the New Vehicle Limited Warranty. The Warranty Addendum applies only the NGPI vehicles delivered in the State of Florida and New York.

WHAT IS NOT COVERED UNDER THE NEW VEHICLE LIMITED WARRANTY?

Damage Caused By:

- accidents, collision or objects striking the vehicle (including driving through a car wash)
- theft, vandalism, or riot
- fire or explosion
- using contaminated or improper fuel/fluids
- customer-applied chemicals or accidental spills
- driving through water deep enough to cause water to be ingested into the engine
- misuse of the vehicle, such a driving over curbs, overloading, racing or using the vehicle as a permanent stationary power source

Damage Caused by Alteration or Modification

The New Vehicle Limited Warranty does not cover any damage caused by:

- alterations or modifications of the vehicle, including the body, chassis, electronics or their components, after the vehicle leaves the control of Ford Motor Company
- tampering with the vehicle, tampering with the emissions systems or with the other parts that affect these systems (for example, but not limited to exhaust and intake systems)

- the installation or use of a non-Ford Motor Company part or software (other than a certified emissions part or software) or any part or software (Ford or non-Ford) designed for off-road use only installed after the vehicle leaves the control of Ford Motor Company, if the installed part fails or causes a Ford part to fail. Examples include, but are not limited to lift kits, oversized tires, roll bars, cellular phones, alarm systems, automatic starting systems and performance-enhancing powertrain components or software and performance “chips”.

  Your vehicle may allow, enable or facilitate the use of certain non-Ford Motor Company software. Ford is not responsible for the functionality of such software. Ford may disallow, discontinue or modify your ability to use such software at any time without prior notification or incurring any warranty or other obligation. Non-Ford Motor Company software may be governed by End User License Agreement or warranty provided by the software provider. For Ford Motor Company software see End User License Agreement found in the Owner Manual.

Damage Caused by Use and/or the Environment

The New Vehicle Limited Warranty does not cover surface rust, deterioration and damage of paint, trim, upholstery, and other appearance items that result from use and/or exposure to the elements. You, as the owner, are responsible for these items. Some examples are:

- dings, dents
- cuts, burns, punctures or tears
- road salt
- tree sap, bird and bee droppings
- windstorm, lightening, hail
- earthquake
- freezing, water or flood
- stone chips, scratches (some examples are on paint and glass)
- windshield stress cracks. However, limited coverage on windshield stress cracks will be provided for the first 12 months or 12,000 miles (which ever occurs first), even though caused by use and/or exposure to the elements.

Maintenance/Wear

The New Vehicle Limited Warranty does not cover: (1) parts and labor needed to maintain the vehicle; and (2) the replacement of parts due to normal wear and tear. You, as the owner, are responsible for these items. See your Owner's Manual. Some examples of maintenance and normal wear are:

- oil changes
- oils, lubricants, other fluids
- oil/air filters
- tire rotation/inflation
- cleaning/polishing
- clutch linings
- wiper blades*
- wheel alignments and tire balancing*
- brake pad/lining*

* Ford will replace or adjust certain maintenance items when necessary, free of charge during a limited period:

- Wiper blade replacements will be provided during the first six months in service, regardless of miles driven.
- Wheel alignments and tire balancing will be provided during the first 12 months or 12,000 miles in service, whichever occurs first.
- Brake pad/lining replacements will be provided during the first 12 months or 18,000 miles in service, whichever occurs first.

SYNC Hands-Free Communications and Entertainment System

If your vehicle is equipped with SYNC, the New Vehicle Limited Warranty does not cover repairs under certain conditions, such as failure to provide proper installation environment. The New Vehicle Limited Warranty does not cover repairs of certain damage or loss, such as:

- Loss of personal recording media, software or data
- Loss, change, or discontinuation of functionality because of:
  - system updates to Ford Motor Company software or lack of compatibility with non-Ford Motor Company electronic devices
  - non-Ford Motor Company software, or
  - obsolescence of vehicle software or hardware
  - lack of network coverage or availability
- Damage caused by:
  - abnormal use such as insertion of foreign objects, fluid spillage
  - unauthorized modification to alter functionality or capability
  - computer or internet viruses, bugs, or malware, such as worms, Trojan Horses, cancelbots

- installation of unauthorized software, peripherals and attachments
- unauthorized, unapproved and/or incompatible repairs, upgrades and modification
- the defective function or obsolescence of your cellular phone or digital media device (for example, inadequate signal reception by the external antenna, viruses or other software problems)

Tire Wear or Damage

The New Vehicle Limited Warranty does not cover normal wear or worn out tires. Tires will not be replaced (unless required by a warranty repair) for wear or damage including:

- tire damage from road hazard such as cuts, snags, bruises, bulges, puncture, and impact breaks
- tire damage due to under or over inflation, tire chain use, racing, spinning (as when stuck in snow or mud), improper mounting or dismounting, or tire repair

Other Items or Conditions Not Covered

The New Vehicle Limited Warranty does not cover:

- vehicles that have had the odometer disconnected, altered, or inoperative for an extended period of time with the result that the actual mileage cannot be determined
- vehicles that have ever been labeled or branded as dismantled, fire, flood, junk, rebuilt, reconstructed, or salvaged; this will void the New Vehicle Limited Warranty
- vehicles that have been determined to be a total loss by an insurance company; this will void the New Vehicle Limited Warranty
- converted ambulances that are not equipped with the Ford Ambulance Prep Package, see important information about ambulance conversions (page 36)
- Aftermarket parts or components, sometimes installed by Ford Motor Company or an authorized Ford dealership, may not be covered by the New Vehicle Limited Warranty. Any damage caused to Ford components due to the failure of aftermarket parts (other than a certified emissions part) is not covered.

4. In addition ...

ROADSIDE SERVICE ASSISTANCE (UNITED STATES, PUERTO RICO, AND U.S. VIRGIN ISLANDS)

Your vehicle is covered by the complimentary Ford Roadside Assistance Program (unless you are driving a daily rental unit). Under this program, Ford will cover:

- Towing to the nearest Ford Motor Company dealership, or towing to your selling dealership if within 35 miles
- Flat tire change (vehicle must have useable spare)
- Fuel delivery (limited to two occurances in a 12-month period up to 2 gal. gas, 5 gal. diesel)
- Jump starts
- Lock-out assistance (replacement key cost is customer responsibility)
- Winching (vehicle must be within 100 feet of a paved or county-maintained road)

The Roadside Assistance Program is separate from the New Vehicle Limited Warranty. It begins at the warranty start date and lasts for five years or 60,000 miles (whichever occurs first). If you need towing beyond the five years or 60,000 miles (whichever occurs first) period, Ford can arrange roadside assistance and charge your credit card. If the reason for the vehicle disablement is later found to be covered by another Ford warranty, Ford will provide a refund for the tow charge under the other warranty, through the dealership.

For emergency roadside assistance, call 1-800-241-3673, 24 hours a day, 365 days a year.

Ford Rent-A-Car (FRAC) and Dealer Daily Rental (DDR) vehicles that must be towed because a covered repair has failed during the warranty coverage period, Ford will cover towing to the nearest Ford Motor Company dealership.

Ford Motor Company reserves the right to modify or discontinue Roadside Assistance at any time. Certain restrictions apply to Roadside Assistance benefits. Call 1-800-241-3673 for further details.

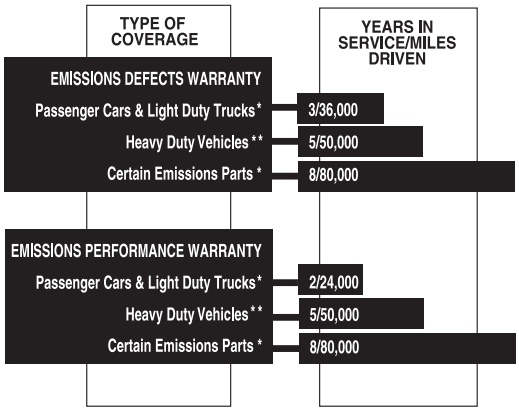
5. Federal requirements for emissions warranties

QUICK REFERENCE: EMISSIONS WARRANTY COVERAGE

This chart shows your warranty coverage under two emissions warranties that Ford Motor Company provides, in compliance with Federal requirements. The warranties are:

- Emissions Defects Warranty
- Emissions Performance Warranty

Emissions Warranties for Your Vehicle



* Applies to vehicles up to 8,500 pounds gross vehicle weight rating (GVWR)
** Applies to trucks over 8,500 pounds gross vehicle weight rating (GVWR) up to 19,500 pounds gross vehicle weight rating (GVWR). Vocational vehicle tires covered for 2/24,000 for defects that affect compliance with greenhouse gas requirements.

For full details on emissions control coverage, see:

➡ **Emissions Defect Warranty** (page 18)
➡ **Emissions Performance Warranty** (page 19)
➡ **What is Covered?** (pages 20-21)
➡ **What is Not Covered?** (page 21)

EMISSIONS DEFECT WARRANTY COVERAGE

During the warranty coverage period, Ford Motor Company warrants that:

- your vehicle or engine is designed, built, and equipped to meet - at the time it is sold - the emissions regulations of the U.S. Environmental Protection Agency (EPA).
- your vehicle or engine is free from emission-related defects in factory-supplied materials or workmanship, which are defects that could prevent the vehicle or engine from conforming with applicable EPA regulations.
- you will not be charged for diagnosis, repair, replacement, or adjustment of parts containing an emissions-related defect. Applicable parts are listed under **What is Covered?** on pages 20-21.

The warranty coverage period for:

- Passenger cars, light duty trucks (applies to vehicles up to 8,500 pounds GVWR)
  - — The emission warranty coverage period is 8 years or 80,000 miles (whichever occurs first) for catalytic converters, electronic emission control units, and onboard emissions diagnostic devices.
  - — All other parts covered under your emissions warranty are warranted for 3 years or 36,000 miles whichever comes first.
- Heavy duty vehicles (applies to trucks over 8,500 pounds GVWR up to 19,500 pounds GVWR)
  - — The emissions warranty coverage period for heavy duty vehicles (HDVs) is 5 years or 50,000 miles (whichever comes first) for all parts covered by your emissions warranty.

    • **Only for HDVs not designated as ″vocational vehicles″ on the underhood ″VEHICLE EMISSION CONTROL INFORMATION″ label:** The 5 year/50,000 mile warranty includes coverage of components whose failure would increase the vehicle's emissions of air conditioning refrigerants.

    • **Only for HDVs designated as ″vocational vehicles″ on the underhood ″VEHICLE EMISSION CONTROL INFORMATION″ label:** Tire defects that affect compliance with emission standards are covered for 2 years or 24,000 miles, whichever comes first.

EMISSIONS PERFORMANCE WARRANTY COVERAGE

Under Emissions Performance Warranty Coverage, Ford Motor Company will repair, replace, or adjust - with no charge for labor, diagnosis, or parts - any emissions control device or system, if you meet all of the following conditions:

- You have maintained and operated your vehicle according to the instructions on proper care in the **Owner's Manual** and this booklet.
- Your vehicle fails to conform, during the warranty coverage period, to the applicable national EPA standards, as determined by an EPA approved inspection and maintenance program.
- You are subject to a penalty or sanction under local, state, or federal law because your vehicle has failed to conform to the emissions standards. (A penalty or sanction can include being denied the right to use your vehicle.)
- Your vehicle has not been tampered with, misused, or abused.

The warranty coverage period for:

- Passenger cars, light duty trucks (applies to vehicles up to 8,500 pounds GVWR)
  — 8 years or 80,000 miles (whichever occurs first) for catalytic converter, electronic emissions control unit, and onboard emissions diagnostic devices.
  — 2 years or 24,000 miles (whichever occurs first) for all other covered parts .
- Heavy duty vehicles (applies to trucks over 8,500 pounds GVWR up to 19,500 pounds GVWR)
  — 5 years or 50,000 miles (whichever occurs first) for all covered parts.

See WHAT IS COVERED for list of covered parts.

Note that the warranty period begins on the **Warranty Start Date** as specified on page 2 of this booklet.

WHAT IS COVERED?

For your vehicle if these parts contain an emissions-related defect, they are covered by both the Emissions Defect Warranty and the Emissions Performance Warranty.

- Air Flow Sensor
- Air/Fuel Feedback Control System and Sensors
- Air Induction System
- Catalytic Converters (including Selective Catalytic Reduction and Diesel Oxidation Catalysts)
- Cold Start Enrichment System (diesel only)
- Controls for Deceleration (diesel only)
- Diesel Exhaust Fluid System
- Diesel Particulate Filter
- Electronic Ignition System (diesel only)
- Electronic Engine Control Sensors and Switches
- Powertrain Control Module (PCM)/Engine Control Module (ECM)*
- Evaporative Emission Control System
- Exhaust Gas Recirculation (EGR) System
- Exhaust Manifold
- Exhaust Pipe (Manifold to Catalyst)
- Fuel Filler Tube and Seal (non-diesel only)
- Fuel Injection System
- Fuel Injector Supply Manifold
- Fuel Tank (non-diesel only)
- Fuel Tank Pressure Control Valve
- Idle Air Bypass Valve
- Ignition Coil and/or Control Module
- Intake Manifold
- Intercooler Assembly - Engine Charger
- Malfunction Indicator Lamp (MIL)/On-Board Diagnostic (OBD) System
- PCV system and Oil Filler Cap
- Secondary Air Injection System
- Spark Control Components
- Spark Plugs and Ignition Wires
- Thermostat
- Throttle Body Assembly (MFI)
- Transmission Control Module (TCM) and Solenoids
- Turbocharger Assembly
- Vacuum Distribution System

* Includes hardware and emissions related software changes only

Important Information About List of Parts

Also covered by the two emissions warranties are all emissions-related bulbs, hoses, clamps, brackets, tubes, gaskets, seals, belts, connectors, non-diesel fuel lines, sensors, and wiring harnesses that are used with components on the list of parts, above.

Concerning parts that should be replaced on a certain maintenance schedule: these parts remain under warranty until : (a) the first replacement time that is specified in your **Owner's Manual**; or (b) the time or mileage limits of the Federal Defect and Performance Warranties (whichever occurs first). Your Ford Motor Company dealer maintains a complete list of parts covered by emissions warranties. For more details about the specific parts covered by the Emissions Defect Warranty, contact your dealer.

WHAT IS NOT COVERED?

Ford Motor Company may deny you emissions warranty coverage if your vehicle or a part does not contain an emissions-related defect or has failed because of abuse, neglect, improper maintenance, unapproved modifications, or any items included in **What Is Not Covered?**, pages 12-15.

If you need more information about getting service under the **Federal Emissions Performance Warranty**, or if you want to report what you believe to be violations of the terms of this warranty, you may contact:

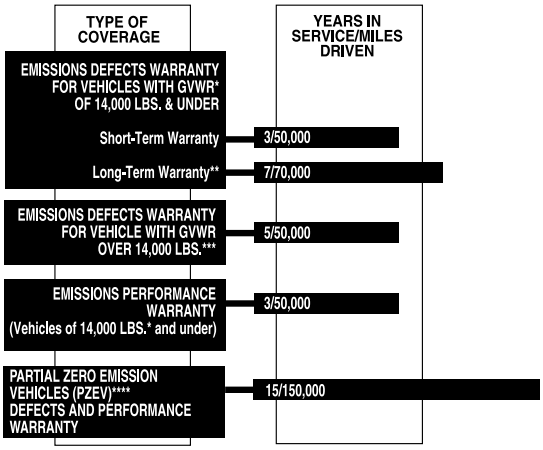
Manager, Certification and Compliance Division
(6405J)
Warranty Claims
Environmental Protection Agency
Ariel Rios building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

6. California requirements for emissions warranties

QUICK REFERENCE: EMISSIONS WARRANTY COVERAGE

This chart shows the emission warranty that Ford Motor Company provides for your vehicle under the emissions control warranty in accordance with the regulations of the California Air Resources Board. This coverage is in addition to Federal Emission warranties (Page 17).

Emissions Warranties for California Certified Vehicles



* Gross Vehicle Weight Rating
** These specific parts were selected on the basis of their estimated replacement cost at the time the California Air Resources Board certified your vehicle for sale in California (up to 14,000 GVWR).
*** Diesel engine vehicles over 14,000 pounds GVWR are covered for 5 years or 100,000 miles.
**** Refer to your Vehicle Emission Control Information Label for emissions certification information.

Vehicles Eligible for California Emission Warranty Coverage

California emission warranty coverage applies if your vehicle meets the following two requirements:

- Your vehicle is registered in a state* that has adopted and is enforcing California emission warranty regulations applicable for your vehicle at the time of repair, and
- Your vehicle is certified for sale in California as indicated on the vehicle emission control information label.

* Subject to change, the following states have adopted and are enforcing California emission warranty regulations:

- **Passenger Car & Light-duty Trucks** (up to 8,500 pounds GVWR) - California, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont and Washington
- **Medium-Duty Passenger Vehicles** (up to 10,000 pounds GVWR designed primarily for the transportation of persons. Excludes incomplete trucks, trucks with a seating capacity either over twelve persons total or over nine persons rearward of the driver's seat, or trucks with an open cargo area of at least six feet of interior length): California, Connecticut, Delaware, Maine, Maryland, Massachusetts, New York, Oregon, Rhode Island, Vermont and Washington
- **Medium-Duty Vehicles** (over 8,500 pounds GVWR up to 14,000 pounds GVWR) - California, Connecticut, Delaware, Maine, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont.
- **Light Heavy-Duty Diesel Engine Vehicles** (over 14,000 pounds GVWR up to 19,500 pounds GVWR) - California, Maine, New York, and Pennsylvania.

Vehicles Eligible for California PZEV Emission Warranty Coverage

California Partial Zero Emission Vehicles (PZEV) have extended coverage on all emission related parts. This extended warranty coverage applies if your vehicle is PZEV certified as indicated on the VECI label and is registered in a state that has adopted and is enforcing California PZEV emissions warranty, which may include the following states, subject to change: California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Rhode Island or Vermont.

For full details about coverage under California requirements for emissions control, see:

➡ **Defects Warranties** (pages 24-30)
➡ **Performance Warranty** (pages 24-25)
➡ **What Is Covered?** (pages 26-29)
➡ **What Is Not Covered?** (page 29)

EXPLANATION OF CALIFORNIA EMISSIONS WARRANTIES

Your Warranty Rights and Obligations

The California Air Resources Board and Ford Motor Company are pleased to explain the emission control system warranty on your 2016-model vehicle. In California, new motor vehicles must be designed, built, and equipped to meet the State's stringent anti-smog standards. Ford must warrant the emission control system on your vehicle for the periods of time listed on pages 24-25, provided there has been no abuse, neglect, or improper maintenance of your vehicle.

Your emission control system may include parts such as the carburetor or fuel injection system, the ignition system, catalytic converter, and the engine computer. Also included may be hoses, belts, connectors, and other emissions-related assemblies.

Where a warrantable condition exists, Ford Motor Company will repair your vehicle at no cost to you including diagnosis, parts, and labor.

Manufacturer's Warranty Coverage

For Vehicles Eligible for California Emission Warranty Coverage

If Gross Vehicle Weight Rating is 14,000 lbs. or less:

For 3 years or 50,000 miles (whichever first occurs):

1. If your vehicle fails a Smog Check inspection, all necessary repairs and adjustments will be made by Ford to ensure that your vehicle passes the inspection. This is your emission control system PERFORMANCE WARRANTY.

2. If any emissions-related part on your vehicle is defective, the part will be repaired or replaced by Ford. This is your short-term emission control system DEFECTS WARRANTY.

For 7 years or 70,000 miles (whichever first occurs):

If an emissions-related part listed on pages 27 and 29 with coverage for 7 years or 70,000 miles is defective or if its failure causes your vehicle to fail a Smog Check inspection, the part will be repaired or replaced by Ford. This is your long-term emission control system DEFECTS WARRANTY.

If Gross Vehicle Weight rating is over 14,000 lbs.:

For 5 years or 50,000 miles (gasoline powered engines and vehicles) or 5 years or 100,000 miles (diesel powered engines and vehicles) (whichever first occurs):

If an emissions-related part on your vehicle is defective, the part will be repaired or replaced by Ford. This is your emission control system DEFECTS WARRANTY.

For Vehicles Eligible for California PZEV Emission Warranty Coverage

For 15 years or 150,000 miles (whichever first occurs):

1. If an emissions-related part on your vehicle is defective, the part will be repaired or replaced by Ford. This is your emissions control system DEFECTS WARRANTY.
2. If your vehicle fails a Smog Check inspection, all necessary repairs and adjustments will be made by Ford to ensure that your vehicle passes the inspection. This is your emission control system PERFORMANCE WARRANTY.

Owner's Warranty Responsibilities

As the vehicle owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Ford Motor Company recommends that you retain all receipts covering maintenance on your vehicle, but Ford cannot deny warranty coverage solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

You are responsible for presenting your vehicle to a Ford Motor Company dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

As the vehicle owner, you should also be aware that Ford Motor Company may deny you warranty coverage if your vehicle or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications.

If you have any questions regarding your warranty rights and responsibilities, or if you want to report what you believe to be violations of the terms of this warranty, you may contact the Ford Customer Relationship Center at 1-800-392-3673 (FORD) or the California Air Resources Board at:

State of California Air Resources Board
Mobile Source Operations Division
P.O. Box 8001
El Monte, California 91731-2990

WHAT IS COVERED?

If the parts on the following list contains a defect that affects emissions, they are covered by the Defects Warranties.

- Air Flow Sensor
- Air/Fuel Feedback Control System and Sensors
- Air Induction System
- Catalytic Converters (including Selective Catalytic Reduction and Diesel Oxidation Catalysts)
- Cold Start Enrichment System (diesel only)
- Controls for Deceleration (diesel only)
- Diesel Exhaust Fluid System
- Diesel Particulate Filter
- Electronic Ignition System (diesel only)
- Electronic Engine Control Sensors and Switches
- Powertrain Control Module (PCM)/Engine Control Module (ECM)*
- Evaporative Emission Control System
- Exhaust Gas Recirculation (EGR) System
- Exhaust Manifold
- Exhaust Pipe (Manifold to Catalyst)
- Fuel Filler Tube and Seal (non-diesel only)
- Fuel Injection System
- Fuel Injector Supply Manifold
- Fuel Tank (non-diesel only)
- Fuel Tank Pressure Control Valve
- Idle Air Bypass Valve
- Ignition Coil and/or Control Module
- Intake Manifold
- Intercooler Assembly - Engine Charger
- Malfunction Indicator Lamp (MIL)/On-Board Diagnostic (OBD) System
- PCV System and Oil Filler Cap
- Secondary Air Injection System
- Spark Control Components
- Spark Plugs and Ignition Wires
- Thermostat
- Throttle Body Assembly (MFI)
- Transmission Control Module (TCM) and Solenoids
- Turbocharger Assembly
- Vacuum Distribution System

* Includes hardware and emissions related software changes only

COVERAGE FOR 2016 MODEL VEHICLES (GVWR OF 14,000 LBS. OR LESS) UNDER LONG TERM DEFECTS WARRANTY
(Coverage for up to 7 years/70,000 miles, whichever first occurs)"

Part Name	1.0L Fiesta	1.0L Focus	1.5L Fusion	1.6L Fiesta	1.6L Escape	1.6L Transit Connect	2.0L Focus	2.0L Fusion	2.0L Escape	2.0L Edge	2.0L Taurus	2.3L Mustang	2.3L Explorer	2.3L Focus	2.5L Fusion	2.5L Escape	2.5L Transit Connect	2.7L Edge	2.7L F-150	3.5L Edge	3.5L Flex	3.5L Explorer	3.5L F-150	3.5L Expedition	3.5L Taurus	3.2L Transit	3.5L Transit	3.7L Transit	3.7L Mustang	3.7L Explorer	3.7L Taurus	5.0L Mustang	5.0L F-150	5.2L Mustang	5.4L Econoline	6.2L F-Superduty	6.7L F-Superduty	6.8L Econoline	6.8L F-Superduty	6.8L Motorhome & Stepvan Chassis
Catalytic Converter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Urea DEF Tank																										X														
Catalyst Inlet Pipe																																					X	X	X
Diesel Urea System Pressure Line																																				X			
Diesel Exhaust Fluid Tank																																				X			
Diesel Catalyst and Particulate Filter Assembly																										X										X			
Cylinder Head Temperature Sensor																			X																				
Turbocharger Actuator Assembly																																				X			
Cam Timing Assembly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X
Engine Variable Timing Assembly																					X	X(3)			X															
Engine Variable Camshaft Timing Solenoid											X							X	X		X	X(3)	X(3)	X	X															
Variable Camshaft Timing Assembly	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X						
PCV Valve (Part of Rocker Cover Assembly)																																						X	X
Turbo to Manifold Gasket																																				X			
Turbocharger	X	X	X	X(3)	X	X	X(3)	X	X	X	X	X	X	X				X	X		X	X(3)	X(3)	X	X	X	X									X				
Charge Air Cooler											X		X												X											X				
Transmission Internal Wiring Harness (2)																											X												
Transmission Control Module	X			X																																			
Transmission Solenoid Assembly			X		X	X		X	X				X		X	X	X					X								X	X					X	X	X	X
Fuel Tank	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Shield Fuel Tank											X														X						X								
Auxiliary Fuel Tank Filler Kit																																		X	X		X	X	
Fuel Supply Manifold Assembly											X							X			X	X(3)	X(3)	X	X	X	X									X				
Fuel Delivery Module					X			X	X							X					X													X	X		X	X	X
Fuel Pump to Fuel Rail Tube											X										X	X	X(3)	X	X		X													
Fuel Pump Assembly		X				X	X				X			X			X				X	X	X(3)	X	X		X													
Turbocharger Control Solenoid				X	X				X												X	X(3)	X(3)	X	X		X													
Intake Manifold											X										X	X			X						X	X	X	X	X	X		X	X	X
Exhaust Manifold (Right-Hand)																					X	X(3)	X	X	X	X	X				X	X	X		X			X	X
Exhaust Manifold (Left-Hand)				X	X	X															X	X(3)	X	X	X		X				X	X	X		X			X	X
Exhaust Manifold Outlet Pipe																																				X			

Part Name	1.0L Fiesta	1.0L Focus	1.5L Fusion	1.6L Fiesta	1.6L Escape	1.6L Transit Connect	2.0L Focus	2.0L Fusion	2.0L Escape	2.0L Edge	2.0L Taurus	2.3L Mustang	2.3L Explorer	2.3L Focus	2.5L Fusion	2.5L Escape	2.5L Transit Connect	2.7L Edge	2.7L F-150	3.5L Edge	3.5L Flex	3.5L Explorer	3.5L F-150	3.5L Expedition	3.5L Taurus	3.2L Transit	3.5L Transit	3.7L Transit	3.7L Mustang	3.7L Explorer	3.7L Taurus	5.0L Mustang	5.0L F-150	5.2L Mustang	5.4L Econoline	6.2L F-Superduty	6.7L F-Superduty	6.8L Econoline	6.8L F-Superduty	6.8L Motorhome & Stepvan Chassis
Exhaust Manifold Gasket					X						X							X	X		X	X	X	X	X	X	X				X	X	X			X			
Flat/Ring Exhaust Gasket					X													X			X	X	X	X	X	X				X		X							
EGR Cooler																																				X				
EGR Cooler Bypass Control Solenoid				X(3)					X									X	X																					
Exhaust Adapter																							X(3)	X			X													
Fuel Injector Kit																																				X				
High Pressure Fuel Pump																										X										X				
Fuel Injector Manifold Return Line																										X														
Fuel Injector											X							X			X	X(3)	X		X	X	X													
Fuel Injector Fuel Supply Manifold																					X		X(4)		X														X	X
Air Intake Throttle Body				X																																			
Fuel Injector Wiring Harness (3)																						X																		
Injection Pressure Sensor									X	X		X	X																											
Instrument Cluster (1)		X	X		X		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X				X	X	X	X	X	X		X	X		X	
Powertrain Control Wiring Harness (2)		X					X			X		X		X				X	X	X			X	X					X			X	X	X	X	X	X	X	X	X
Engine Control Sensor and Fuel Charge Wiring Assembly (2)																										X														
Engine Electronic Control Coolant Sensor																			X																					
Powertrain Control Module (PCM)/ Engine Control Module (ECM)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Knock Sensor																			X																					
Main Body Wiring Harness (2)	X		X	X				X			X	X	X		X			X	X	X	X	X	X		X				X	X	X	X	X	X		X	X		X	
Dash Panel & Headlamp Junction Wiring (2)		X			X		X		X		X	X	X	X		X					X	X			X				X	X	X	X		X					
Wiring Assembly - Interior (2)	X	X	X								X										X				X						X									
Main Wiring Assembly (2)		X	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X			X	X		X	X	X	X			X	X	X	X	X	X	X	X
Rear Lamp Wiring Assembly (2)																			X				X	X									X		X	X	X	X	X	X
Fuel Sender Wiring Assembly (2)			X					X							X											X	X	X							X	X	X	X		
Main Jumper Wiring Assembly (2)			X					X							X																									

(1) for Service Engine Soon/Malfunction Indicator Lamp (MIL) functionality concerns only

(2) for MIL illumination only

(3) for EcoBoost Engine only

(4) for non-EcoBoost Engine only

Important Information about List of Parts

There may be additional coverage for these parts through the Bumper to Bumper, Powertrain, or Diesel Engine limited warranties. In any case, the warranty with the broadest coverage applies.

Also covered by this warranty are all emissions-related bulbs, hoses, clamps, brackets, tubes, gaskets, seals, belts, connectors, non diesel fuel lines, and wiring harnesses that are used with components on the list of parts above.

Concerning parts that should be replaced on a certain maintenance schedule: these parts remain under warranty until the first required replacement time that is specified in your **Owner's Manual**.

NOTE: If the diagnosis does not reveal a defect, the Defects Warranty does not apply.

Your Ford Motor Company dealer maintains a complete list of covered parts. For more details about the specific parts that are covered by the Defects Warranty, contact your dealer.

WHAT IS NOT COVERED?

Ford Motor Company may deny you emissions warranty coverage if your vehicle or a part does not contain a defect that affects emissions or has failed because of abuse, neglect, improper maintenance, unapproved modifications, or any items included in **What Is Not Covered?**, pages 12-15.

7. Additional information about your emissions warranty coverage, under Federal and California requirements

HOW DO I GET WARRANTY SERVICE?

To get service under your emissions warranties, take your vehicle to any Ford Motor Company dealer as soon as possible after illumination of the Malfunction Indicator Light or it has failed an EPA-approved test or a California Smog Check inspection. Be sure to show the dealer the document that says your vehicle has failed the test.

Your dealer will determine whether the repair is covered by the warranty. If the dealer has a question about Emissions Performance Warranty coverage, it will forward the question to Ford Motor Company, which must make a final decision within 30 days after you bring your vehicle in for repair. (The decision will be made within a shorter time if state, local, or federal law requires you to have the vehicle repaired more quickly in order to avoid additional penalties.) The deadline for a determination about Emissions Performance Warranty Coverage does not need to be met if you request a delay, agree to a delay in writing, or if the delay is caused by an event for which neither Ford nor your dealer is responsible. If a question about Emissions Performance Warranty coverage is referred to Ford Motor Company, you will be notified by Ford Motor Company in writing if your claim for warranty coverage is denied. The notice will explain the basis for denying your claim. If you fail to receive this notice within a timely manner, as determined above, Ford will perform the warranty repair for you free of charge.

HOW DO I HANDLE EMERGENCY REPAIRS?

If your vehicle needs an emergency warrantable repair and a Ford Motor Company dealer is not available, or if a Ford Motor Company dealer cannot perform warrantable repair(s) within 30 days of you bringing your vehicle to the dealer, repairs may be performed at any service establishment or by you using Ford equivalent replacement parts.

Ford will reimburse you for the cost of these warranty repairs including diagnosis, if you take the part(s) that are replaced and the repair receipt(s) to a Ford Motor Company dealer. The reimbursement shall not exceed Ford's suggested retail price for the warranted parts that are replaced and labor charges based on Ford's recommended time allowance for the warranty repair and the geographically appropriate hourly rate.

WHAT REPLACEMENT PARTS SHOULD I USE?

Ford Motor Company recommends that you use genuine Ford replacement parts. However, when you are having non-warranty work done on your vehicle, you may choose to use non-Ford parts. If you decide to use non-Ford parts, be sure they are equivalent to Ford parts in performance, quality, and durability. If you use replacement parts that are not equivalent to Ford parts, your vehicle's emissions control systems may not work as effectively, and you may jeopardize your emissions warranty coverage.

For vehicles within the warranty period, Ford will repair at no cost to the owner, under the Federal Emissions Warranty, covered emission failures caused by properly installed Ford parts or non-Ford parts that have been certified by the U.S. Environmental Protection Agency (EPA). Ford is not responsible for the cost of repairing any emission failures caused by non-Ford parts that have not been certified by the EPA.

The maintenance, replacement, or repair of emissions control devices or systems can be performed by any automotive repair establishment or individual using Ford replacement parts or EPA certified parts without voiding your federal warranty coverage for future repairs during the warranty period.

PROPER MAINTENANCE PRESERVES YOUR WARRANTY

If you do not maintain your vehicle properly, Ford may have the right to deny you warranty coverage.

To have repairs made under this warranty, you may have to show that you have followed Ford's instructions on properly maintaining and using your vehicle. You will find these instructions in your **Owner's Manual**. Be sure to save your service receipts and to keep accurate records of all maintenance work.

CUSTOMER ASSISTANCE

If you are not satisfied with the handling of a warranty matter, see **Customer Assistance**, on the inside front cover, and **Better Business Bureau (BBB) AUTO LINE program**, page 34.

8. Noise emissions warranty

NOISE EMISSIONS WARRANTY FOR CERTAIN LIGHT TRUCKS

Ford Motor Company warrants to the first person who purchases this vehicle for purposes other than resale and to each subsequent purchaser that this vehicle as manufactured by Ford, was designed, built and equipped to conform at the time it left Ford's control with all applicable U.S. EPA Noise Control Regulations.

This warranty covers this vehicle as designed, built and equipped by Ford Motor Company, and is not limited to any particular part, component or system of the vehicle as manufactured by Ford. Defects in design, assembly or in any part, component or system of the vehicle as manufactured by Ford, which, at the time it left Ford's control, caused noise emissions to exceed Federal standards, are covered by this warranty for the life of the vehicle.

THE NOISE EMISSIONS WARRANTY OBLIGATIONS DO NOT APPLY TO:

- loss of time, inconvenience, loss of use of the vehicle, commercial loss or, other consequential damages.
- any vehicle which is not covered by the U.S. EPA Medium and Heavy Trucks Noise Emission Standards (40 C.F.R. Part 205, Subpart B). Among the non-covered vehicles are those lacking a partially or fully enclosed operator's compartment, such as a basic stripped chassis, those having a Gross Vehicle Weight Rating of 10,000 pounds or less, and those sold outside the United States and its territories. To the extent permitted by law, THIS WARRANTY IS EXPRESSLY INSTEAD of any express or implied warranty, condition, or guarantee, agreement, or representation, by any person with respect to conformity of this vehicle with the U.S. EPA Noise Control Regulations, including ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS.

9. Ford Extended Service Plan

MORE PROTECTION FOR YOUR VEHICLE

You can get more protection for your new car or light truck by purchasing a Ford Extended Service Plan (Ford ESP). Ford ESP service contracts are backed by Ford Motor Company or subsidiaries of Ford Motor Company (examples are but not limited to: Ford Motor Service Company or the American Road Insurance Company). ESP plans provide up to 8 years and 125,000 miles of coverage.

They provide:

- benefits during the warranty period, depending on the plan you purchase can be: reimbursement for a rental vehicle, protecting against tire and wheel road hazard damage, coverage for certain maintenance and wear items, lost key replacement, other plans are available;
- protection against covered repair costs and continuing Roadside Service Assistance benefits after you Bumper to Bumper Warranty expires.

You may purchase Ford ESP from any Ford Motor Company dealer or see our website at Ford-ESP.com. There are several Ford ESP plans available in various time, distance and deductible combinations. Each plan is tailored to fit your own driving and vehicle ownership needs, including reimbursement for towing and rental.

When you purchase Ford ESP, you receive peace-of-mind protection throughout the United States and Canada and Mexico, provided by a network of more than 4,600 Ford Motor Company dealers.

NOTE: Repairs performed outside the United States, Canada, Mexico, Guam or Puerto Rico are not eligible for Ford ESP coverage.

This information is subject to change. Ask your dealer for complete details about Ford ESP coverage.

10. The Better Business Bureau (BBB) AUTO LINE Program (U.S. Only)

Your satisfaction is important to Ford Motor Company and to your dealer. If a warranty concern has not been resolved using the three-step procedure outlined on the first page of the Customer Assistance section, you may be eligible to participate in the BBB AUTO LINE program.

The BBB AUTO LINE program consists of two parts — mediation and arbitration. During mediation, a representative of the BBB will contact both you and Ford Motor Company to explore options for settlement of the claim. If an agreement is not reached during mediation and your claim is eligible, you may participate in the arbitration process. An arbitration hearing will be scheduled so that you can present your case in an informal setting before an impartial person. The arbitrator will consider the testimony provided and make a decision after the hearing.

You are not bound by the decision, but should you choose to accept the BBB AUTO LINE decision, Ford must abide by the accepted decision as well. Disputes submitted to the BBB AUTO LINE program are usually decided within forty days after you file your claim with the BBB.

BBB AUTO LINE Application: Using the information provided below, please call or write to request a program application. You will be asked for your name and address, general information about your new vehicle, information about your warranty concerns, and any steps you have already taken to try to resolve them. A Customer Claim Form will be mailed that will need to be completed, signed, and returned to the BBB along with proof of ownership. Upon request, the BBB will review the claim for eligibilty under Program Summary Guidelines.

You can get more information by callng BBB AUTO LINE at 1-800-955-5100, or writing to:

BBB AUTO LINE
3033 Wilson Boulevard, Suite 600
Arlington, Virginia 22201

BBB AUTO LINE applications can also be requested by calling the Ford Motor Company Customer Relationship Center at 1-800-392-3673.

Note: Ford Motor Company reserves the right to change eligibility limitations, modify procedures, or to discontinue this process at any time without notice and without obligation.

11. State warranty enforcement laws

These state laws - sometimes called lemon laws - allow owners to receive a replacement vehicle or a refund of the purchase price, under certain circumstances. The laws vary from state to state.

To the extent your state law allows, Ford Motor Company requires that you first send us a written notification of any defects or non-conformities that you have experienced with your vehicle. (This will give us the opportunity to make any needed repairs before you pursue the remedies provided by your state's law.)

In all other states where not specifically required by state law, Ford Motor Company requests that you give us the written notice. Send your written notification to:

Ford Motor Company
Customer Relationship Center
P.O. Box 6248
Dearborn, MI 48126

12. Important information about ambulance conversions

Ford vehicles are suitable for producing ambulances only if equipped with the **Ford Ambulance Prep Package**. In addition, Ford urges ambulance manufacturers to follow the recommendations of the **Ford Incomplete Vehicle Manual** and the **Ford Truck Body Builders Layout Book** (and pertinent supplements).

Using a Ford vehicle without the Ford Ambulance Prep Package to produce an ambulance could result in elevated underbody temperatures, fuel overpressurization, and the risk of fuel expulsion and fires. Such use also voids the Ford Bumper to Bumper Warranty and may void the Emissions Warranties.

You may determine whether the vehicle is equipped with the **Ford Ambulance Prep Package** by inspecting the information plate on the driver's rear door pillar.

You may determine whether the ambulance manufacturer has followed Ford's recommendations by contacting the ambulance manufacturer of your vehicle.

RAIN BOOTH INFORMATION

Constructed as part of a corporate-wide pre-delivery inspection facility, the Forest River 20' x 50' motorized vehicle rain booth utilized by Starcraft and Startrans Bus offers exceptional performance in the area of water leak detection.

The motorized vehicle rain booth adds front wall nozzles to the design of the towable rain booth, simulating the pelting of oncoming rain at highway speeds. Both booths include two 1200 gallon recycling tanks and utilize a 12Horsepower pump with multi-bank filters capable of delivering 40 – 60 p.s.i. That equates to 300 gallons per minute pushed through the spray heads, or the equivalent of a 24 inch-per-hour downpour!

With nozzles directed at the roof, sidewalls, front and undercarriage, nothing goes untouched in our quest for leak elimination. Using both velocity and volume in our test procedure ensures our valuable customers that we are doing the utmost to deliver a leak-free product to them.

Visitors are always welcome to witness the test booths whenever they are in operation.

2367 Century Drive, Goshen, IN 46528 PH: 800-348-7440 FAX: 574-642-4389

GATEWAY^{AI}

High Idle & Lift Interlock
With Programmable Load Control

FEATURES & BENEFITS

- Fully compliant FMVSS 403/404 wheel-chair lift interlock
- Dynamic Load Response (DLR) technology– monitors engine RPM & maintains speed at all load conditions
- Charge protect on gas & diesel engines
- Automatic engagement when on A/C command is detected
- *Heater Boost* for improved cabin heat on diesel engines
- Dash-mounted control panel has LEDs to display electrical system, Automatic Fast Idle (AFIS) & Intelligent Lift Interlock System (ILIS) status
- Simple, single-point "Plug & Play" connection.. Super fast installation & No cutting of factory wires
- Solid state microprocessor controller.. No additional solenoids, cables, or brackets
- Capable of providing "Real-Time" chassis data via the CAN Bus
- Diagnostic trouble codes can be retrieved for "hard" faults & intermittent faults in non-volatile memory
- Intermittent Fault Filter (IFF)® technology filters out all erroneous changes in sensor signals
- Multiple & configurable chassis electrical load inputs/outputs

Gateway^{AI} Module

WHY GATEWAY^{AI}?

- Gateway^{AI} is a fully Compliant FMVSS 403/404 wheelchair interlock & fast idle system all in one, easy to install module!
- Fast Idle– monitors OEM sensor inputs from transmission, engine, charging system, air conditioner, ambient air temperature, & vehicle speed to determine if high idle is needed. Automatically maintained when loads are added or removed such as A/C or wheelchair lift.
- Lift Interlock– Controls shift interlock by processing signals from transmission, parking brake and lift door to electronically lock down the vehicles ability to move in unsafe conditions

GATEWAY^{AI}

Gateway^{AI} Options

THE GATEWAY^{AI} PRODUCT FAMILY

- Gateway with BrakeMax Controller
  - All of the features of the Gateway/ ILIS plus a controller for Ford & GM vehicles with Tow/ Haul mode. This controller engages the Tow/Haul mode on start-up of the vehicle thereby providing the fleet with maximum "Tow/ Haul" mode benefits without having the driver think about it.
- Gateway with DuraTrans
  - All of the features of the Gateway/ ILIS plus a controller for Ford & GM vehicles with an Overdrive button. Overdrive is disabled until the vehicle speed reaches 55 MPH. Overdrive will not be disabled until the vehicle speed drops below 30MPH
- Gateway with Merlin
  - All of the features of Gateway/ILIS plus the ability of the Merlin Multiplex System to use real-time chassis data to operate coach loads
- Azure Option
  - ILIS interlock functions for use on an Azure hybrid electric vehicle

Standard Gateway^{AI} LED Panel

Starcraft uses the panel below as standard

Standard Gateway^{AI} Door Ajar LED Panel

Interlock Only LED Panel

Interlock Only Door Ajar LED Panel

SPECIFICATIONS

Physical Specifications:

Dimensions:	2.0"W x 4.0"L x 0.9"H
Weight:	.14 lbs
Operating Temperature:	40ºC to 85ºC

Electrical Specifications

Power Input:	+8 to 16 Vdc @ 1 amps for module control +8 to 16 Vdc @ 8 amps for lift enable
Lift Enable:	+12v @ 8 amps
Programmable Outputs:	Ground @ 0.5 amps each

US Patent No's. 6,594,565 / 6,965,819 / 7,274,980

INTERMOTIVE VEHICLE CONTROLS
An ISO 9001:2008 Registered Manufacturer
www.InterMotive.net 800-969-6080

Made in the U.S.A.

FlexTech

INTERMOTIVE VEHICLE CONTROLS

An ISO 9001:2015 Registered Company

FlexTech™

Programmable Electrical System

Overview

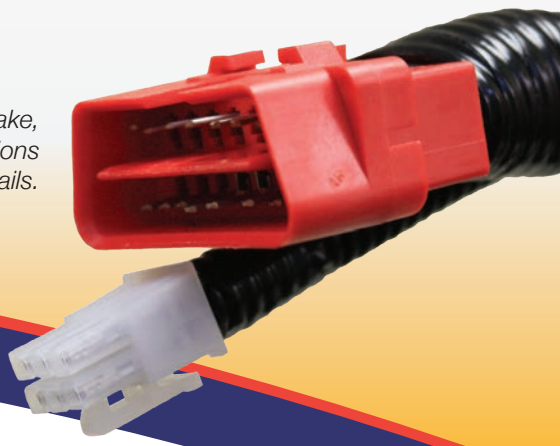
- Foundation of the system is a Programmable Relay Power Center
- Can add optional modules to create an entire custom control system
- Connects electronic modules through the overall vehicle network, reducing the need for wiring
- Uses real-time chassis data to control loads
- Simple plug and play connections to the OEM chassis

Features

- Centralizes and improves diagnostic capabilities; eliminates the need for timers, flashers, latching relays and multi-relay logic
- Access to InterMotive's graphical interface allows for customization of the entire system
- Communicates with Ford and Chevy CAN as well as J1939
- Warning LEDs for easy troubleshooting

Watch FlexTech in action

Product features may vary by make, model or year. See instructions for complete details.



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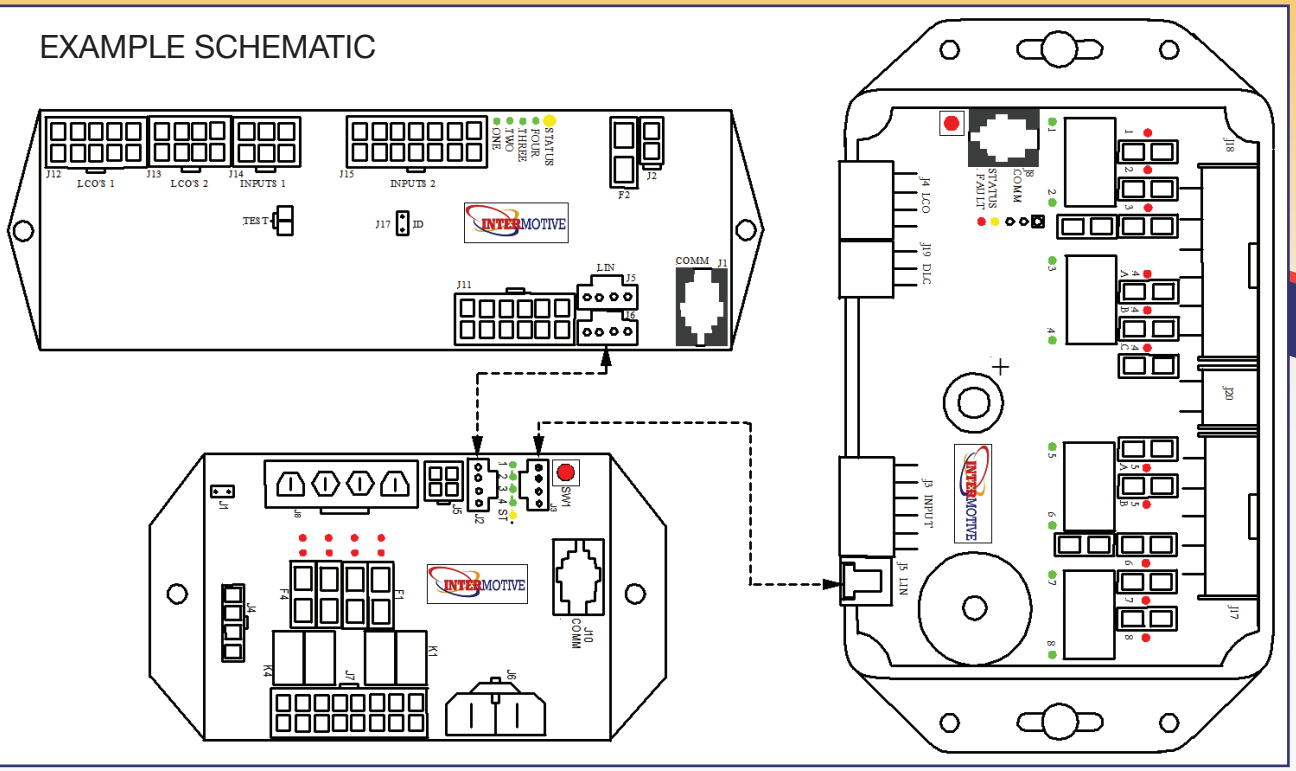
Details

EXAMPLE SCHEMATIC



COMPONENTS

Programmable Relay Power Board (PRPC)

- Eight programmable relay power outputs
- Ten separate digital inputs
- Eight programmable low-current outputs: Seven sourcing (0.5 A), one sinking (0.5 A)
- Outputs can be configured as momentary, latching, flashing or timed
- Easy diagnostics with LED indicators
- Programmable audible patterns for multiple uses

Expansion Board (Optional)

- Four 10 A relay fused outputs
- Four 1 A low-current outputs
- Four active low outputs
- Loads controlled by the PRPC

Switch Backer Board (Optional)

- Controls system inputs and outputs
- Eight switches and eight light outputs
- Two switch backer boards can be used together
- Six outputs: Two 1 A and four 0.5 A
- Compatible with any brand of switches

Other Module Options

- Gateway: Compliant FMVSS 403/404 wheelchair interlock and high idle system
- Advanced Fast Idle System (AFIS): Adjustable system with battery charge protection and optional air conditioning auto trigger
- BrakeMax: Tow haul mode for reduced brake wear

SAFE-T-SCOPE™

Color Backup Camera System with 7” LCD Monitor

for Trucks, Vans, Buses & Motor Homes

STSK7465

Weatherproof - Heavy Duty Camera Provides 120° Field of Vision
Night-Vision - 18 High-Output InfraRed LED’s Provide up to 30 ft. Range
Integrated Audio - Built in Camera Mic & Powerful Monitor Speakers
High Resolution - 7” LCD with Ultra Sharp Display & Rugged Housing
Versatile Mount - Dashboard, Windshield or Overhead Location

ROSCO® *A Century of Automotive Vision Safety* VisionSystems

MONITOR P/N: STSM242

Screen Size (Diagonal)	7”
Resolution	1440(H) x 234(V)
Screen Ratio	16:9
Contrast Ratio	350:1
Voltage Input	10~32 Vdc
Voltage Output	12 Vdc
Max No. of Cameras	1
Viewing Angles Up/Dn/Lt/Rt	15 x 35 x 50 x 50
Shock Rating	100g
Vibration Rating	15g
Color Configuration	RGB Stripe
Operating Temperature °F (C°)	-5° to +150° (-20° to +65°)
Storage Temperature °F (C°)	-13° to 158° (-25° to +70°)
Dimensions WxHxD in (mm)	6.9 x 5 x 1 (175 x 125 x 23)
Weight lb. (Kg)	0.9 (0.5)
Other Features	Switch - selectable mirror/normal image, Button - selectable day/night dimming

CAMERA P/N: STSC141

Image Device	Sony¼” CCD
Pixels	270,000
TV Lines	420
Video Output	1.0 Vp-p, 75 Ohm
Field of View	120°
Lens Focal Length	2.6mm
Sync System	Internal
Minimum Illumination	0 Lux (Infrared LED’s on)
IfraRed LED’s	18 High-Output
Night Vision Range	30 feet
Dust\Water Rating	IP67
Operating Temperature °F (°C)	5° to 150° (-15° to +65°)
Storage Temperature °F (°C)	-5° to 160° (-20° to +70°)
Dust/Water Rating	IP67
Shock Rating	100g
Vibration Rating	15g
Power Supply	12 Vdc from Monitor
Current	200 mA
Operating Temperature F° (C°)	-15° to +160° (-25° to +70°)
Storage Temperature F° (C°)	-20° to +176° (-30° to +80°)
Dimensions WxHxD in (mm)	3 x 2 x 2 (75 x 48 x 49)
Weight lb. (Kg)	0.6 (0.26)

HARNESS P/N: STSH341

65’ Heavy Duty with Twist-lock Connectors

ROSCO® VisionSystems

A Century of Automotive Vision Safety

90-21 144th Place
Jamaica, New York 11435
Phone: 718-526-2601
Fax: 718-297-0323
www.roscovision.com

Cat No. 0923

JENSEN

AM/FM/WB/CD/RBDS/USB/App Ready/SiriusXM Ready/iPod® & iPhone® Ready/Bluetooth

JHD36A

App Ready Bluetooth® SiriusXM SATELLITE RADIO

PRODUCT FEATURES

- 12V DC power
- Control stereo functions from your smart device with the JENSEN ***jHD Control*** app
- 180 watts max (45W x 4)
- Electronic AM/FM tuner (US/Euro)
- Audio streaming and controls (A2DP/AVRCP) from Bluetooth-enabled devices
- Receives phone calls (HFP) from Bluetooth-enabled phones
- SiriusXM-Ready™
- NOAA seven-channel weatherband with SAME technology
- iPod/iPhone ready via front USB
- 30 sec. Electronic Skip Protection (ESP)
- Front and rear AUX input
- Pre-amp out (RCA)
- Public Announcement (PA) ready
- Full dox matrix LCD with white LED backlighting
- Amber backlit buttons
- Non-volatile memory
- Low-battery alert (Voltage < 10.8 VDC)
- 12/24 hr selectable clock with Super-Cap, 30-day power back-up
- Conformal coated PCB
- IR remote control ready (sold separately)
- Channel lock
- RBDS

Optional Accessory (not included)

JMICHFP Omnidirectional Microphone

- 12 ft. cable with locking connector
- Visor clip and 3M adhesive pad included
- Compatible with all JENSEN Heavy Duty stereos with Bluetooth

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AM/FM/WB/CD/RBDS/USB/APP Ready
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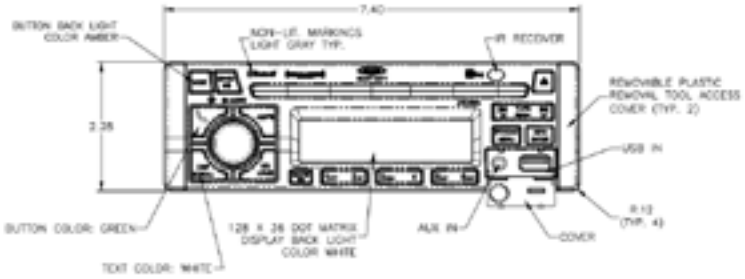
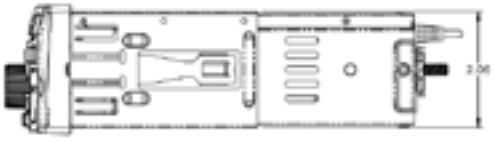
JHD36A





Specifications

General Specifications

Power System		**12 VDC**	
Operating Voltage Range		**9 V to 18 V**	
Current Draw @ 12V	**Quiescent**	**0 A**	
	Standby	**50 mA**	
	Maximum	**10.0 A**	
Operating Temperature Range		**–22°F to 185°F**	**–30°C to 85°C**
Storage Temperature Range		**–40°F to 185°F**	**–40°C to 85°C**
Maximum Relative Humidity		**95%**	
Overall Dimensions		**7.4” x 2.1” x 6.3”**	
Product Weight (unpackaged)		**3.50 lbs.**	

Performance Specifications

FM Sensitivity		**2.2 uV**
AM Sensitivity		**20 uV**
CD Frequency Response		**20 Hz to 20 kHz**
CD Signal to Noise		➢ **726 dB**
CD Skip Threshold (Random Freq. Profile)		**2.0 g**
Compatible CD Formats		**Audio CD, CD-R, R/W, MP3**
Output Power	**RMS**	**23.9 W x 4**
	Maximum	**45 W x 4**
Total Harmonic Distortion @ 1 Watt		**1%**
Applied Test Suite		**ASA ES0013**
Regulatory Certification		**FCC Part 15B / E-Mark**

Features and specifications subject to change without notice.

The following information is submitted for all Glaval Bus products proposed on METROPOLITAN TRANSIT AUTHORITY IFB 4018000162 as supporting documentation of the structural soundness and impact resistance of the bodies manufactured. All vehicles are built using virtually the same materials with some minor differences in the height and width of cross members due to entry floor heights and/or body width variations.

A representative set of construction prints provided by engineering supplements this verbal accounting of our materials and assembly specifications.

If, in the reviewing of these written technical specifications and engineering frame prints submitted any questions arise, please contact us immediately for any clarification or help in interpretation and understanding.

3.0 Body Construction – General Frame Construction

Manufactured from all galvanized steel products, the floor, roof, side walls, rear wall, driver halo assembly and entry door assembly are all wire welded (MIG) together to form an integral galvanized steel frame that is mounted with specified hardware to the rubber body mount points (pucks) supplied by the chassis manufacturer. Once joined to the chassis, the bus finishing process begins.

3.0.1 Floor frame construction and assembly –

3.0.1.1 Cross Members -- The floor cross members form the base structural support for the rest of the frame components. Our cross members are constructed of 14 gauge galvanized steel, formed to a capital "C" shape. Cross members over the fuel tank are made to provide the clearance needed to conform with FMVSS301, and include formed internal reinforcements welded in place for additional strength. All additional longitudinal and latitudinal structure is flush welded in place to form a one piece floor upon completion.

3.0.1.2 Galvanized steel "Hat Posts" – 1"x1"x4" run the length of the floor between cross members and are welded into place. This extremely strong form is used to weld our HSLA steel seat track in place.

3.0.1.3 Galvanized steel C Channel – 1"x1.5" C channel is welded in between cross members the full length of the floor in 5 places. Coupled with the Hat Posts this provides a one-piece strong "ladder" type frame for the flooring.

3.0.1.4 Seat Track – 12 gauge roll formed high strength/low alloy steel is wire welded in place for seat mounting down each side of the bus, with lengths predicated on the floor plan chosen. This is yet another stiffener in our extensive construction process.

3.0.1.5 Wheel Wells -- Constructed of 14 gauge galvanized steel, wheel wells are also welded in during the floor construction process. All seams in the wheel well are welded to create a one piece water resistant wheel housing structure. The wheel wells also provide additional strength to the body assembly, when welded in place.

3.0.1.6 Structural Galvanized steel Angle – 1/8" thick 1.5" x 2.5" structural galvanized steel angle is used the full perimeter length of each floor assembly, welded to the ends of all floor cross members. This provides not only a flat plane for joining the sidewall assembly, but also ties all cross members together and provides additional side impact resistance.

3.0.1.7 Additional structure – When adding vertical stanchions, wheel chair lifts and/or tie down options, additional structure is welded into the floor at locations specified by our engineering department on CAD drawings.

3.0.2 Sidewall Construction –

3.0.2.1 Sidewall vertical member – The heart of our sidewall is the vertical structure, a roll formed 18 gauge galvanized steel 1.5" x 2" tube that provides strength and rigidity. The vertical member is installed in full lengths and in shorter sections below window frames. Additional vertical structure is used at both ends of the sidewall enabling the structure to withstand the forces applied by the vehicle when in motion.

3.0.2.2 Galvanized steel Tubing – 1.5"x1" lower and 1.5"x3" upper 16 gauge galvanized steel tubing is welded in horizontally between vertical members to frame in window openings. This adds front to rear reinforcement as well.

3.0.2.3 Seat Track – 12 gauge high strength/low alloy roll formed galvanized steel track is welded down each sidewall below the window frame. While serving as a seat attaching device, it adds excellent structure to the sidewall and also adds excellent side impact resistance.

3.0.2.4 Wheelchair Options – Add another layer of metal. Depending on track locations, another structure of 11 gauge thick galvanized steel is welded in place between each vertical member for attaching a shoulder belt mount. Also, additional structure is added to accommodate wheelchair door frames – either 1.5"x1" or 1.5"x2" 16 gauge wall glavanized steel tubing..

3.0.2.5 Full length glavanized steel tubing – 1.5"x1" 16 gauge galvanized steel tubing is stitch welded to the sidewall bottom and top at each vertical member for attaching to the floor and roof sections, respectively.

3.0.3 Rear Wall Construction –

3.0.3.1 Rear wall vertical member – The vertical sidewall 1.5"x 2" galvanized steel tube is also used in the rear wall assembly. Full length structure is used at varying places,

depending on choice of rear window, or rear door. Shorter cut pieces are used above windows and doors. Additional side windows used with the rear door also change the configuration.

3.0.3.2 Galvanized steel Tubing – 1.5”x1” 16 gauge aluminized steel tubing is welded horizontally between vertical members to provide a window frame in the standard product, and used as an upper door frame in the optional rear assembly.

3.0.3.3 Full length galvanized steel tubing – 1.5”x1” 16 gauge galvanized steel tubing is stitch welded to the rear wall top and bottom as in the sidewall

assembly. **3.0.4 Roof Construction –**

3.0.4.1 Roof Bows – Radius formed one-piece 16 gauge galvanized steel roof bows formed as a modified hat post design with eight bends for exceptional strength and located on 16” centers (the closest in the industry), including 4 bends in the web that allows for the roof structure to be capable of taking severe loads. They are then capped with top flat pieces from flange to flange to provide abundant surface area for securing the exterior roof material.

3.0.4.2 Galvanized steel Tubing – 1.5”x1” 16 gauge aluminized steel tubing is welded in horizontally to frame all lower window openings and 1.5” x 3” 16 gauge galvanized steel tubing to all upper window openings as required. A full perimeter is also welded on to mate the roof to the sidewall and rear wall, with short vertical pieces providing support on the front and rear ends. The 3” wide galvanized steel tube supplies a structural mounting surface for shoulder belt attachment and has been pull tested to federal standards.

3.0.5 Driver Compartment Overhead Halo –

3.0.5.1 Galvanized steel Tubing – 1”x1” 16 gauge galvanized steel tubing is cut and jig welded into an integrated one piece structure spanning from the front roof bow of the body to the newly cut roof line of the cab. Also created during the structure manufacture is the housing for mounting the electronic circuit board.

3.0.5.2 11 Gauge Galvanized steel – formed to make brackets used to mount to the chassis roof.

3.0.6 False Floor (Cab to body transition) –

3.0.6.1 Galvanized steel Tubing – 2” x 2” 16 gauge galvanized steel tubing is welded together forming a flat body floor transition from the step area back to the actual body area. An overhang on the curbside provides a secure attach point frontally for the entry door frame added later.

3.0.6.2 Structural galvanized steel angle – 11 gauge 1.5”x1.5” structural angle is added in short lengths five places to provide attachment points to the chassis floor.

3.0.7 Interior Vertical Transition Frames –

3.0.7.1 Galvanized steel Tubing – 1”x1” 16 gauge galvanized steel tubing is used vertically and a ladder type assembly is made welding the 1x 1 tube to .75”x.75” 11 gauge galvanized steel tube that is used horizontally in the assemblies. These pieces transition from the body fronts on each side to the driver halo side assembly and the entry door frame assembly on the curbside.

3.0.8 Entry Door & Step Assembly Frame –

3.0.8.1 Galvanized steel Tubing – 1”x1” 16 gauge and .75”x.75” 11 gauge galvanized steel tube is cut to length and welded together in a ladder type construction forming a rigid frame for attaching the entry door/step assembly.

3.0.9 Entry Door/Step Assembly –

3.0.9.1 11 Gauge Galvanized steel – The step riser/tread piece is manufactured from one-piece 11 gauge galvanized steel and uses 90º bends at all risers and treads. The bottom tread also adds an additional 90° bend for additional strength and safety. Upper and lower side pieces are then attached and an 11 gauge flat plate with holes is used to bridge the lower and upper side pieces, then is stitch welded and plug welded to form a strong one piece assembly prior to inserting and welding to the entry step framing.

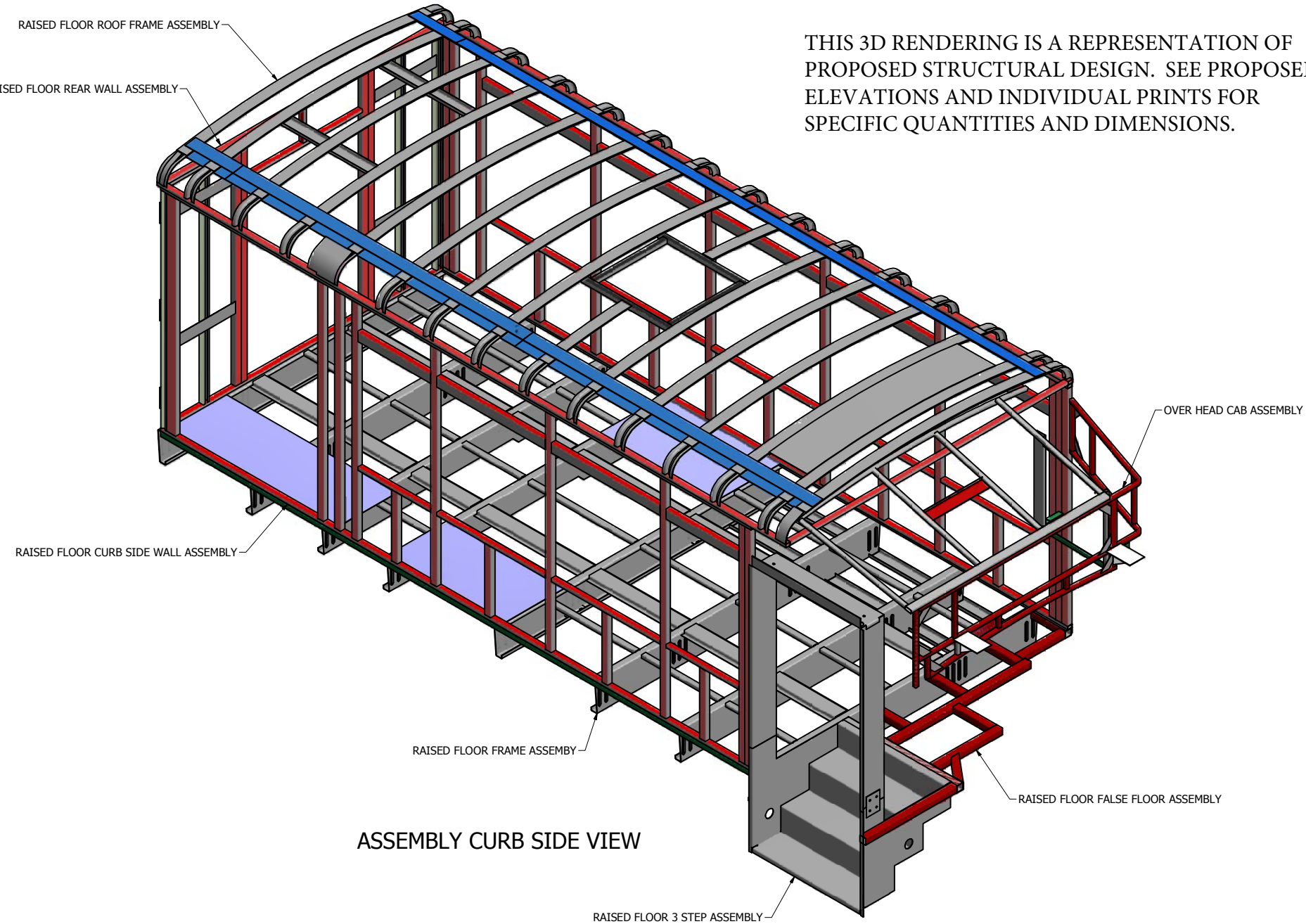
APPLICATION OF EXTERIOR SIDEWALL MATERIAL

GALVANIZED STEEL SIDEWALLS OR OPTIONAL FIBERGLASS/FRP/COMPOSITE SIDEWALLS

The exterior is .024” galvanized steel pre-painted white with an underlayment of 5/32” luan.
The interior is 5/32” luan covered with a light gray FRP or padded vinyl.
The foam filled galvanized steel cage is placed in the center and all layers are adhered using a cross linked polyurethane hot melt adhesive. The entire assembly is then laminated to assure adhesion.

Composite FRP exterior sidewall panels are installed using the same method.

Should any further questions arise, please contact your Glaval Bus representative.



THIS 3D RENDERING IS A REPRESENTATION OF PROPOSED STRUCTURAL DESIGN. SEE PROPOSED ELEVATIONS AND INDIVIDUAL PRINTS FOR SPECIFIC QUANTITIES AND DIMENSIONS.

ASSEMBLY CURB SIDE VIEW

*****ALL MATERIALS GALVANIZED*****

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
BUS	A	REPLACED WALL BOWS WITH TUBE	6/13/2018	TAS

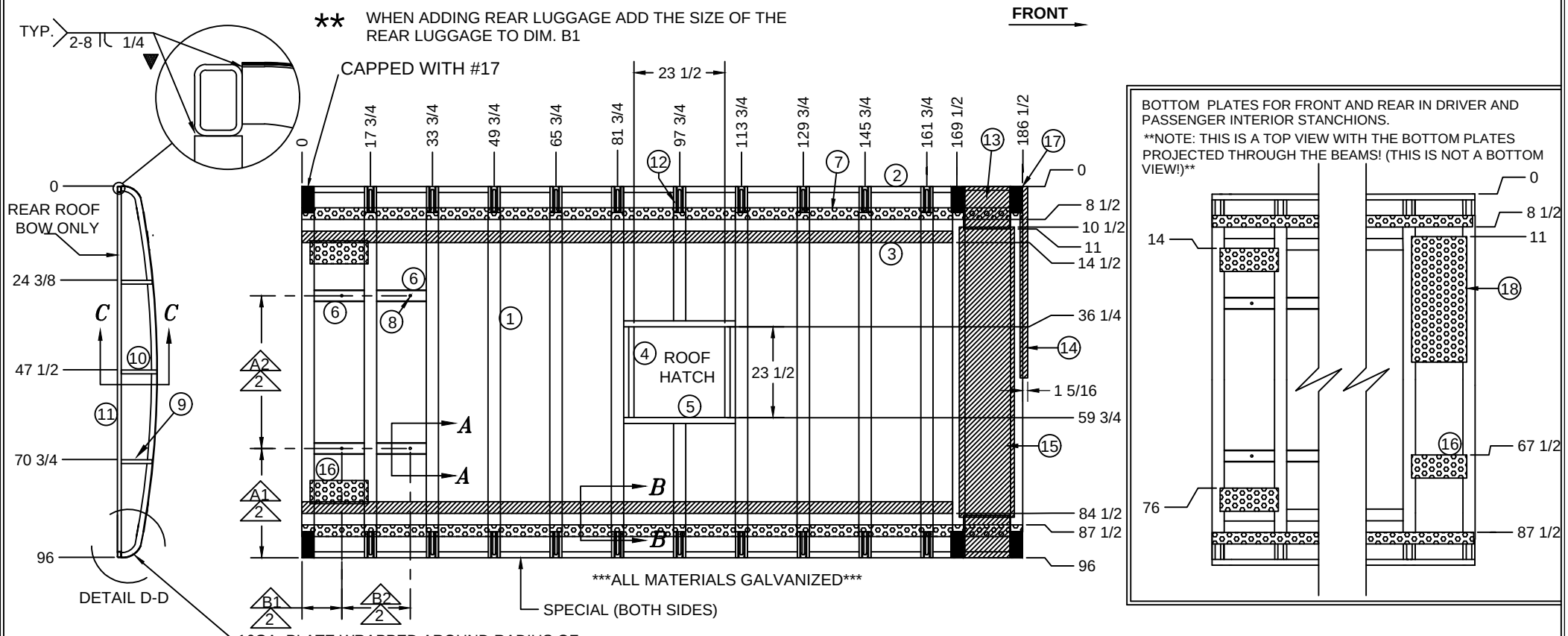
Glaval Bus
A Division Of Forest River, Inc.

DFTSN: TAS	TITLE	Ford Step Entry Raised Floor Assembly	
DATE: 08/27/13	DWG NO	84156B-2	SHEET 1 OF 1

▼ CRITICAL CONTROL ITEM

USAGE: 2011 ALLSTAR, FORD MODEL 24

** WHEN ADDING REAR LUGGAGE ADD THE SIZE OF THE REAR LUGGAGE TO DIM. B1



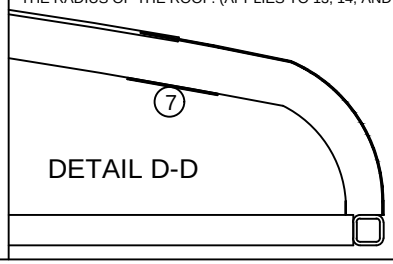
BOTTOM PLATES FOR FRONT AND REAR IN DRIVER AND PASSENGER INTERIOR STANCHIONS.

NOTE: THIS IS A TOP VIEW WITH THE BOTTOM PLATES PROJECTED THROUGH THE BEAMS! (THIS IS NOT A BOTTOM VIEW!)

NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.
2- A/C BOLT PATTREN MAY VERY SEE SALES ORDER.
3- BEFORE CUT ROOF HATCH SEE SALES ORDER.
4- SCREW LOCATION AT SEAMS AND EDGES 8" ON CENTER ALL OTHER LOCATION 16" ON CENTER.
5- SEALANT USAGE: 1/4" MIMIMUM 3/8"MAXIMUM BEAD ON ALL ROOF FRAME TO LUAN SURFACES.

SHADED AREA SHOWS 16GA. PLATE FORMED AROUND THE RADIUS OF THE ROOF. (APPLIES TO 13, 14, AND 17)**



- ADDITIONAL CAP
- PLATE WELDED TO TOP OF ROOF BOWS
- PLATE WELDED TO BOTTOM OF ROOF BOWS

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
5	2	70009047	"C" CHANNEL: 16ga. x 1-3/8" x 1-3/8" x 30-1/2" Lg.
4	2	70009047	"C" CHANNEL: 16ga. x 1-3/8" x 1-3/8" x 24-1/4" Lg.
3	2		SHEET STEEL: 16ga. x 3" x 168-1/2" Lg.
2	2		TUBE: 16ga. x 1" x 1.5" x 186-1/2" Lg. A-513
1	12	02062357	ROOF BOW W/CAP 16ga. x 3-3/16 x 96" Lg.

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
20	0		PLATE: 16ga. x 10" x 16" Lg.
19	0		SHEET STEEL: 16ga. x 3" x 77" Lg.
18	1		SHEET STEEL: 16ga. x 14-1/4" x 32-1/2" Lg.
17	6		PLATE: 16ga. x 1-1/2" x 9" Lg.
16	3		SHEET STEEL: 16ga. x 6" x 15" Lg.
15	1		PLATE: 16ga. x 14-1/4" x 75" Lg.
14	1		SHEET STEEL: 16ga. x 2" x 52-1/2" Lg.
13	2		SHEET STEEL: 16ga. x 12" x 15" Lg.
12	2	02062357	ROOF BOW W/CAP 16ga. x 3-3/16 x 35-1/4" Lg.
11	1		TUBE: 16ga. x 1" x 1" x 93" Lg. A-513
10	1		TUBE: 16ga. x 1" x 1" x 8-1/2" Lg. A-513
9	2		TUBE: 16ga. x 1" x 1" x 8" Lg. A-513
8	4		BOLT: 3/8-16 x 3" Lg. HEX HEAD
7	2		SHEET STEEL: 16ga. x 3" x 186-1/2" Lg.
6	4	70009046	"C" CHANNEL: 16ga. x 1" x 3-1/2" x 14-1/2" Lg.

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

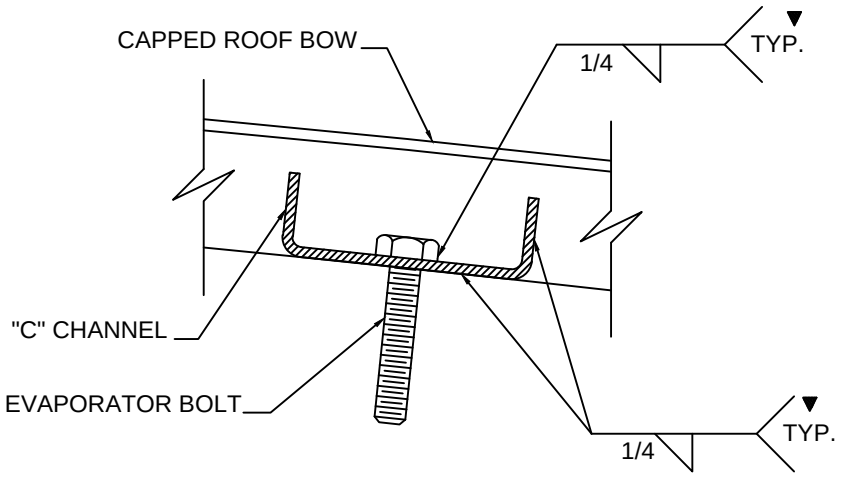
TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

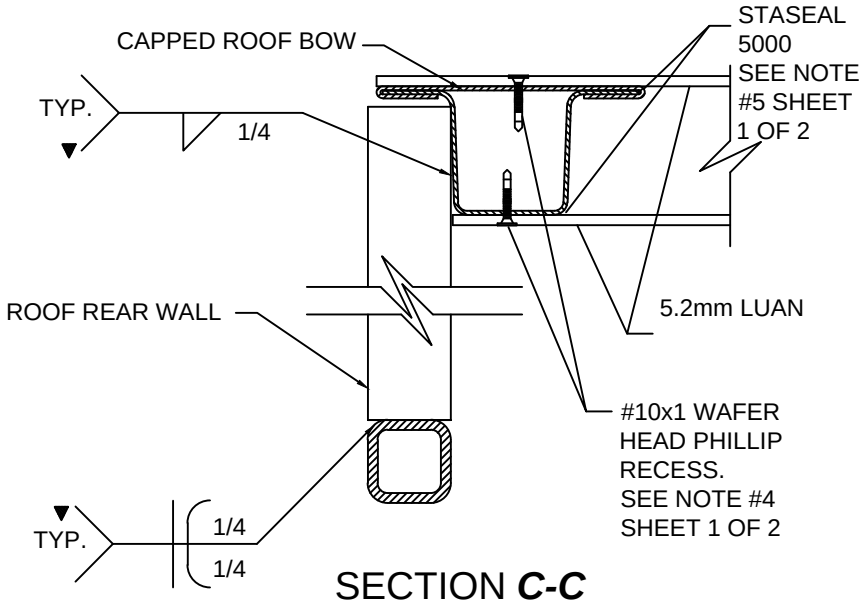
Glaval Bus *a division of Forest River, Inc.*

DATE: 06/11/18
NAME: MKLINE
TITLE: 158" WHEEL BASE MODEL 24 ROOF FRAME, STD. ROOF, SINGLE HATCH
DWG. No. 32-13-0017-18

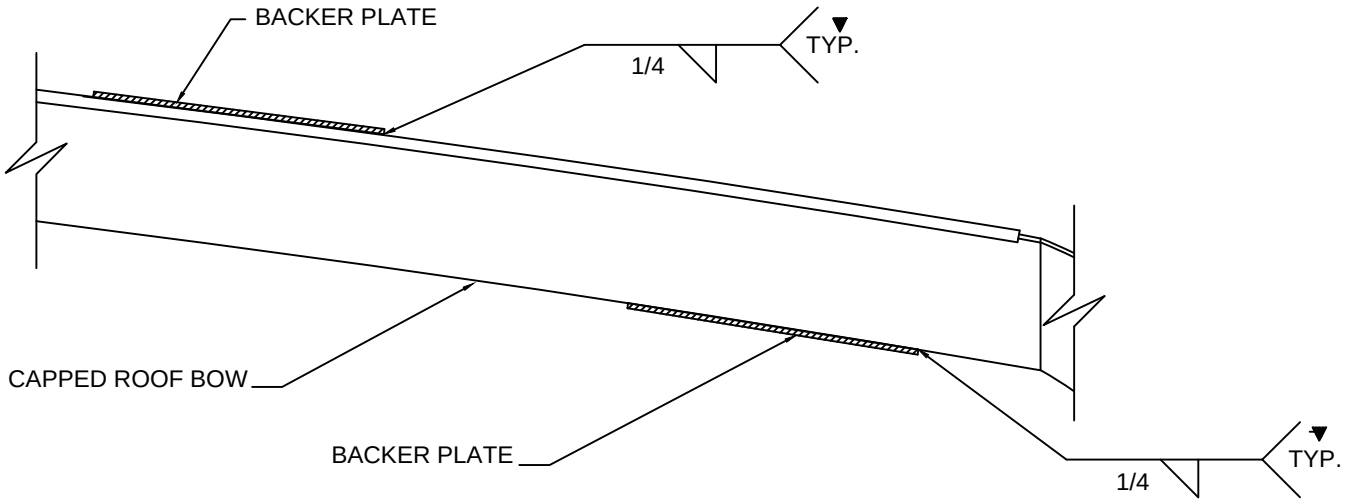
▼ CRITICAL CONTROL ITEM



SECTION ***A-A***



SECTION ***C-C***



SECTION ***B-B***

T/A-71 NEW STYLE	33-5/8	30	10	12-1/4
ACC 23022 SERIES	38	20	10	14-3/4
ACC 23023 SERIES	33-5/8	28-3/4	10	14-3/4
T/A-77	18-1/4	59-1/2	10	10-3/8
T/A-73	28-1/4	39-1/2	10	9-1/2
T/A-71 OLD STYLE	33-5/8	28-3/4	10	12-1/4
T/A-70	36-3/4	22-1/2	10	11-5/8
T/A-30	31	34	10	9-1/2
EM-14 & RE-29	30-3/4	34-1/2	10	9-1/2
EM-6 & RE-10	36	24	10	9-1/2
EM-3 & RE-30	28-1/4	39-1/2	10	16
RE-15 & RE-20	28-1/4	39-1/2	10	9-1/2
EM-1 & EM-2	28-1/4	39-1/2	10	9-1/2
EM-7 GEN 5	36-1/8	23-3/4	10	9-1/2
EM-2 GEN 5	32-3/8	31-1/16	10	9-1/2
EM-1 GEN 5	28-3/16	39-5/8	10	9-1/2
EVAPORATOR MODEL	A-1	A-2	B-1	B-2

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

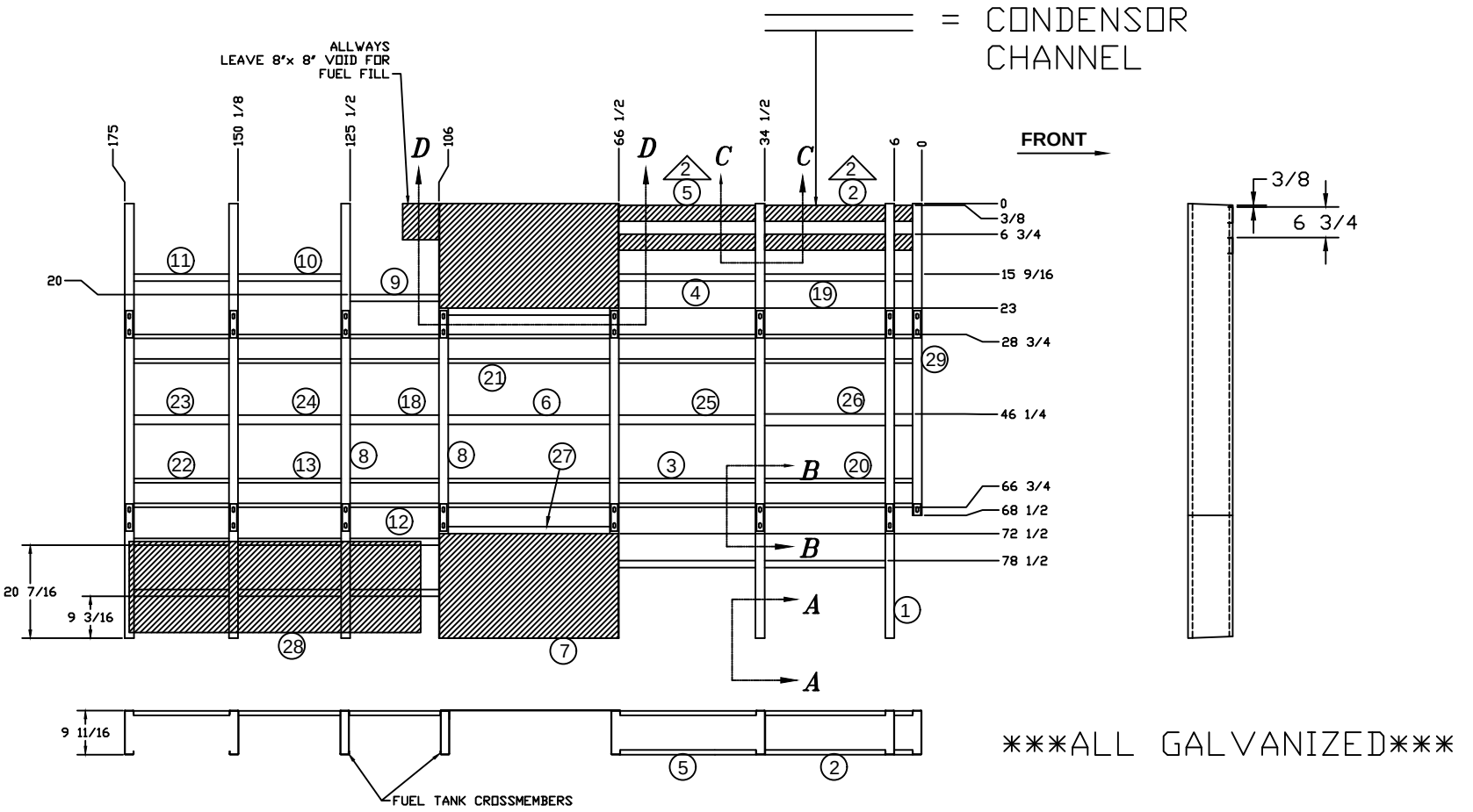
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus *a division of Forest River, Inc.*

DATE: 06/11/18
NAME: MKLINE
TITLE: 158" WHEEL BASE MODEL 24 ROOF FRAME, DETAILS SINGLE HATCH
DWG. No. 32-13-0017-18

▼ CRITICAL CONTROL ITEM

USAGE: 2011, FORD 158" WHEEL BASE, MODEL 24, 42" ENTRYWAY



NOTES:

1- DRAWING VIEWED FROM INTERIOR SIDE OF UNIT.

2 2- LOCATION OF A/C BRACKETS: ONE MOUNT FLUSH WITH OUTSIDE EDGE OF CROSSMEMBER. THE OTHER MOUNTS 14-3/4" FROM OUTSIDE EDGE OF CROSSMEMBER.

3- SEE SHEET 2 OF 2 FOR DETAILS, TORQUE SPECIFICATIONS, SECTION VIEWS AND CUT LIST.

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
7	2	71002066	SHEET STEEL: 11ga. x 24" x 39-1/4" Lg. HRS
6	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 35-5/8" Lg.
5	2	70009046	"C" CHANNEL: 12ga. x 1" x 3-1/2" x 30" Lg.
4	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 30" Lg.
3	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 30" Lg. A-513
2	2		"C" CHANNEL: 12ga. x 1" x 3-1/2" x 26-1/2" Lg.
1	5	71009018	14ga. x 2 x 9-11/16 x 95-1/2 CROSSMEMBER A-365

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

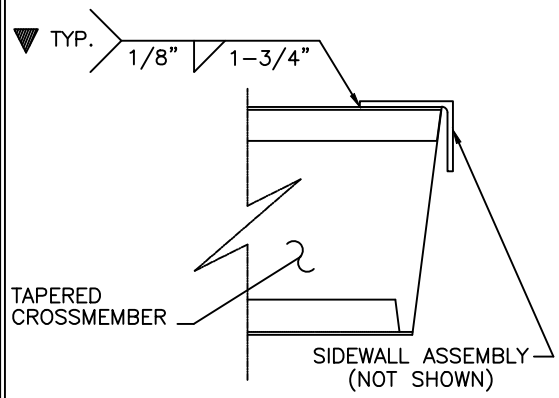
Glaval Bus a division of Forest River, Inc.

DATE 6/14/18 | TITLE: 158" WB MODEL 24 FLOOR FRAME, RAISED FLOOR

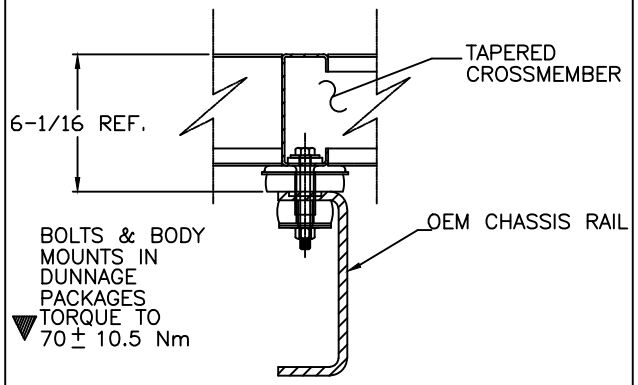
NAME: MKLINE

DWG. No. 32-13-0031-18 SPECIAL

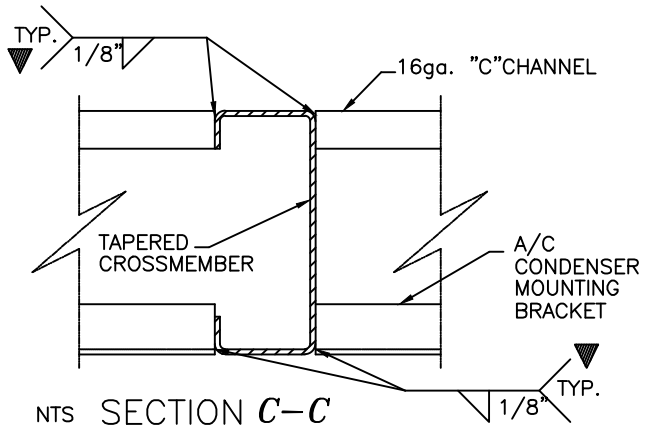
▼ CRITICAL CONTROL ITEM



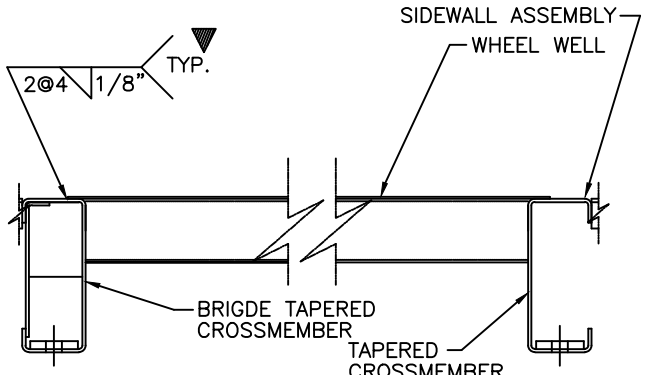
NTS SECTION ***A–A***



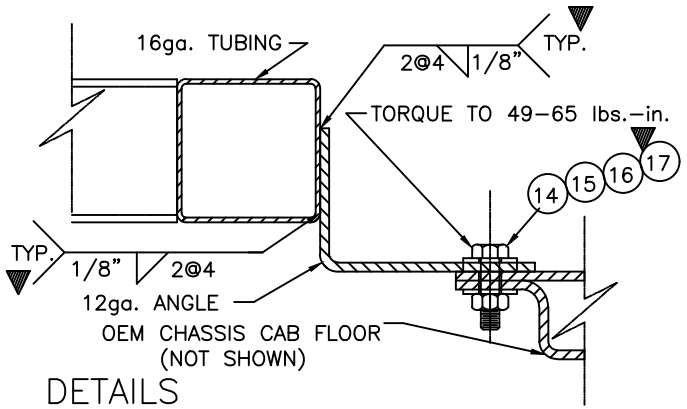
NTS SECTION ***B–B***



NTS SECTION ***C–C***



NTS SECTION ***D–D***



NTS DETAILS

ALL GALVANIZED			
29	1		14ga. x 2 x 9-11/16 x 68-1/2 CROSSMEMBER A-365
28	2		PLATE: 11ga. 20" x 64" Lg.
27	2	71002028	TUBE: 16ga. x 1-1/2" x 1-1/2" x 35-5/8" Lg. A-513
26	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 26-1/2" Lg.
25	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 30" Lg.
24	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 22-3/8" Lg.
23	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 20-7/8" Lg.
22	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 20-7/8" Lg. A-513
21	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 35-5/8" Lg. A-513
20	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 26-1/2" Lg. A-513
19	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 26-1/2" Lg.
18	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 19-3/4" Lg.
17	7	80052007	NUT, HEX HEAD 3/8-16 UNC GRADE 5 ZINC
16	7	80042015	WASHER MED LOCK 3/8 ZINC
15	14	80042007	WASHER 3/8 USS ZINC
14	7	80112051	BOLT, HEX HEAD 3/8-16 X 1 UNC GRADE 5 ZINC
13	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 22-3/8" Lg. A-513
12	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 19-3/4" Lg. A-513
11	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 20-7/8" Lg.
10	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 22-3/8" Lg.
9	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 19-3/4" Lg.
8	2	70009055	14ga. x 2 x 4-13/16 x 95-1/2 bridge crossmember
REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

DATE 6/14/18 | TITLE: 158" WB MODEL 24 FLOOR FRAME, RAISED FLOOR

NAME: MKLINE | DWG. No. 32-13-0031-18 SPECIAL

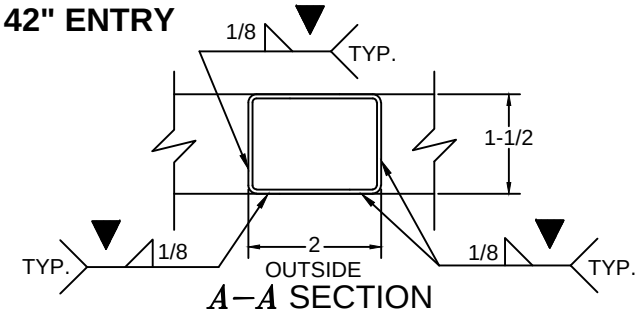
▼ CRITICAL CONTROL ITEM

USAGE: FORD 158"WB/MODEL 24, 42" ENTRY

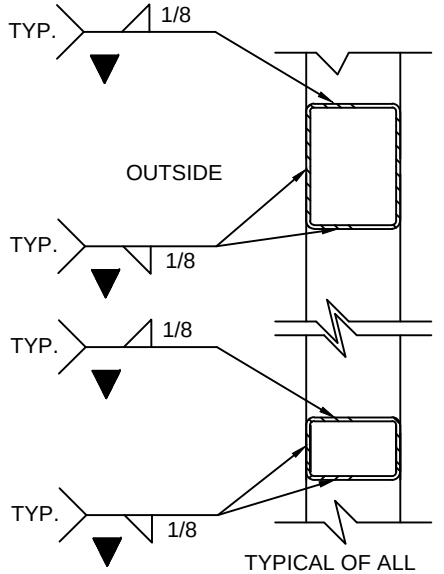
NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2- ANGLE TO BE WELDED FLUSH WITH OUTSIDE EDGE OF WALL.

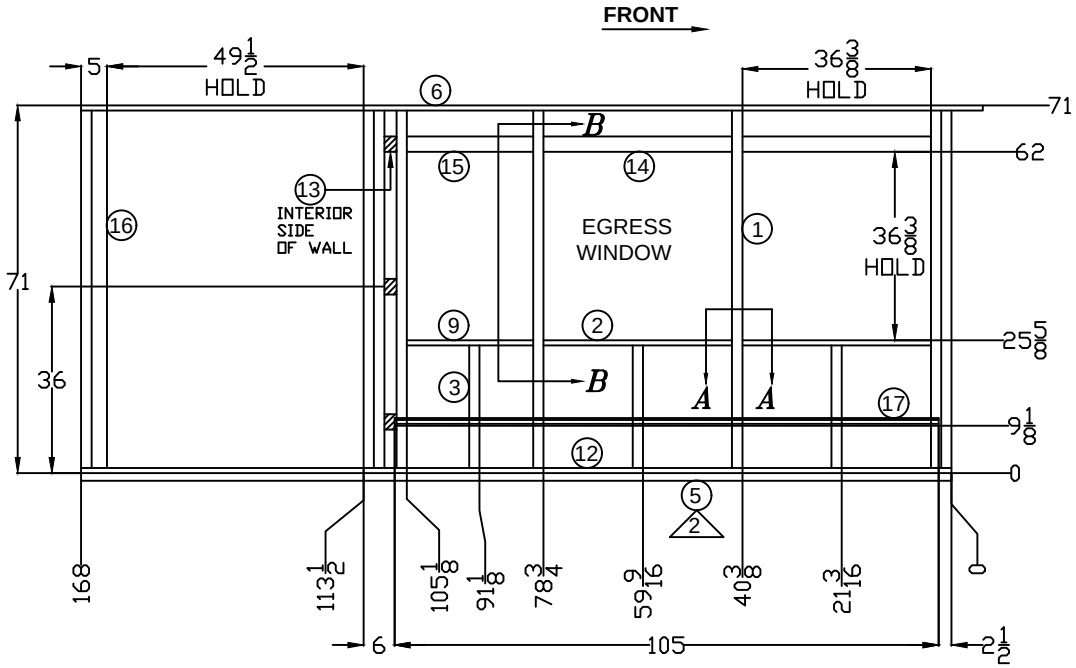


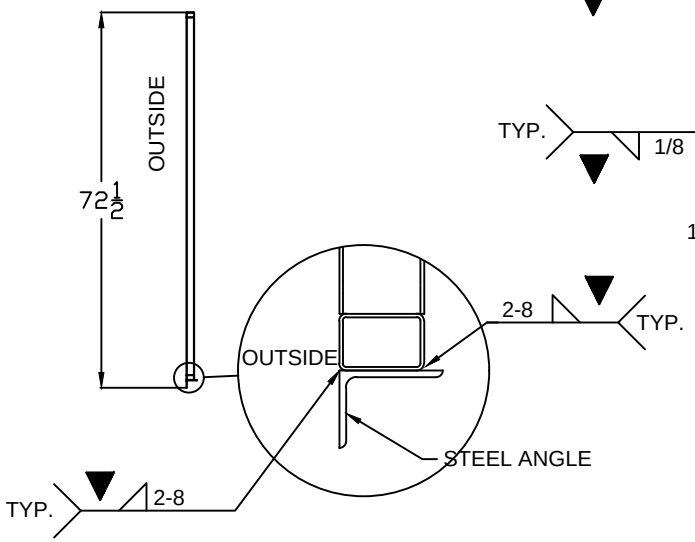
$A-A$ SECTION



TYPICAL OF ALL OPENINGS WHERE 1-1/2" x 1" TUBING USED.

SECTION $B-B$





ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
8	0		FRAME, SIDEWALL WHEEL WELL FORD
7	0		TUBE: 18ga. x 1-1/2" x 2" x 66-13/16"Lg. A-513
6	1		TUBE: 16ga. x 1-1/2" x 1" x 174"Lg. A-513
5	1		ANGLE: 11ga. x 1-1/2" x 2" x 168"Lg. A-513
4	0		TUBE: 16ga. x 1-1/2" x 1" x 46-3/4"Lg. A-513
3	4		TUBE: 18ga. x 1-1/2" x 2" x 23-5/8"Lg. A-513
2	2		TUBE: 16ga. x 1-1/2" x 1" x 36-3/8"Lg. A-513
1	8		TUBE: 18ga. x 1-1/2" x 2" x 69"Lg. A-513

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
17	1		SEAT TRACK: 105-1/2"Lg.
16	1		TUBE: 18ga. x 1-1/2" x 3" x 69"Lg. A-513
15	1		TUBE: 16ga. x 1-1/2" x 3" x 24-3/8"Lg. A-513
14	2		TUBE: 16ga. x 1-1/2" x 3" x 36-3/8"Lg. A-513
13	3		STRAP: 11ga. x 3" x 2-3/8"Lg. A-513
12	1		TUBE: 16ga. x 1-1/2" x 1" x 168"Lg. A-513
11	0		ANGLE: 11ga. x 1-1/2" x 2" x 65-3/4"Lg. A-513
10	0		TUBE: 16ga. x 1-1/2" x 1" x 64-3/4"Lg. A-513
9	1		TUBE: 16ga. x 1-1/2" x 1" x 24-3/8"Lg. A-513

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

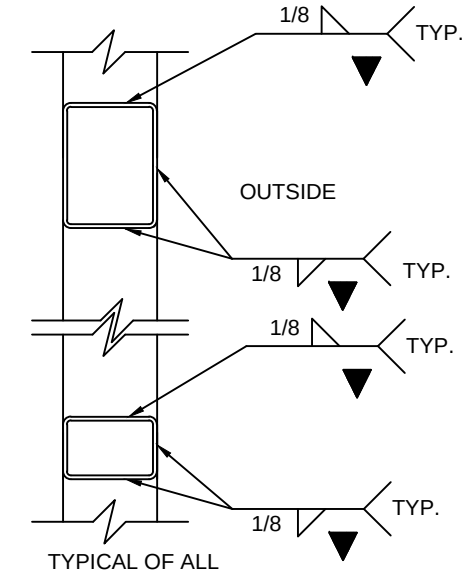
DATE: 6/14/18 NAME: MKLINE

TITLE: 158" WB MODEL 24, 42" ENTRY SIDEWALL, R. LIFT, RAISED FLOOR

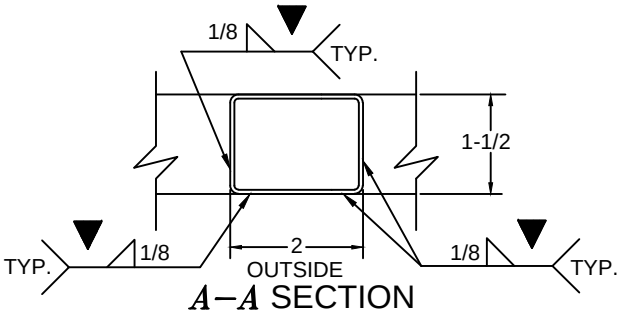
DWG. No. 32-13-0030-18 SPECIAL 42 ENTRY

▼ CRITICAL CONTROL ITEM

USAGE: FORD 158"WB/MODEL 24



TYPICAL OF ALL OPENINGS WHERE 1-1/2" x 1" TUBING USED.

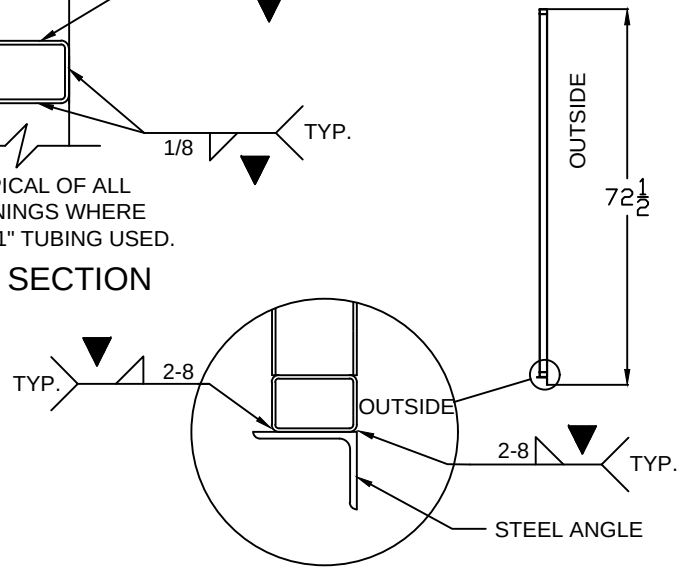


$A-A$ SECTION

NOTES:

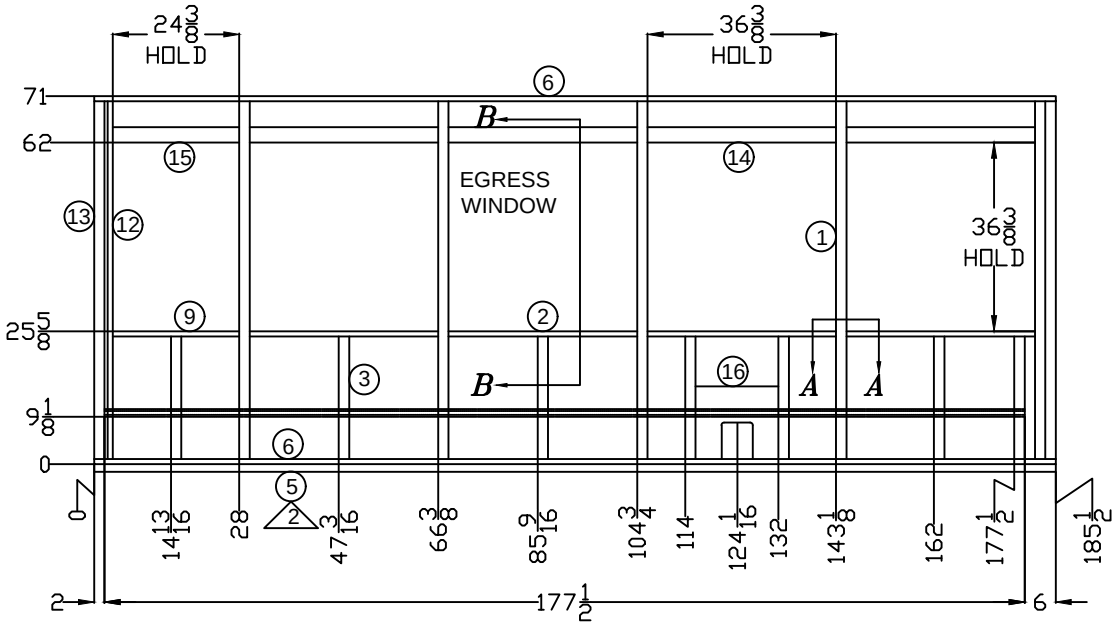
1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2- ANGLE TO BE WELDED FLUSH WITH OUTSIDE EDGE OF WALL.



$B-B$ SECTION

FRONT



ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
8	0		FRAME, SIDEWALL WHEEL WELL FORD
7	0		TUBE: 18ga. x 1-1/2" x 2" x 70-7/8"Lg. A-513
6	2		TUBE: 16ga. x 1-1/2" x 1" x 185-1/2"Lg. A-513
5	1		ANGLE: 11ga. x 1-1/2" x 2" x 185-1/2"Lg. A-513
4	0		TUBE: 16ga. x 1-1/2" x 1" x 79-9/16"Lg. A-513
3	7		TUBE: 18ga. x 1-1/2" x 2" x 23-5/8"Lg. A-513
2	4		TUBE: 16ga. x 1-1/2" x 1" x 36-3/8"Lg. A-513
1	5		TUBE: 18ga. x 1-1/2" x 2" x 69"Lg. A-513

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
17	1		SEAT TRACK: 177-1/2"Lg.
16	1		FUEL FILL BACKER BOARD
15	1		TUBE: 16ga. x 1-1/2" x 3" x 24-3/8"Lg. A-513
14	4		TUBE: 16ga. x 1-1/2" x 3" x 36-3/8"Lg. A-513
13	2		TUBE: 16ga. x 1-1/2" x 2" x 69"Lg. A-513
12	1		TUBE: 16ga. x 1-1/2" x 1" x 69"Lg. A-513
11	0		ANGLE: 11ga. x 1-1/2" x 2" x 70-3/16"Lg. A-513
10	0		TUBE: 16ga. x 1-1/2" x 1" x 70-3/16"Lg. A-513
9	1		TUBE: 16ga. x 1-1/2" x 1" x 24-3/8"Lg. A-513

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

Glaval Bus — a division of Forest River, Inc.

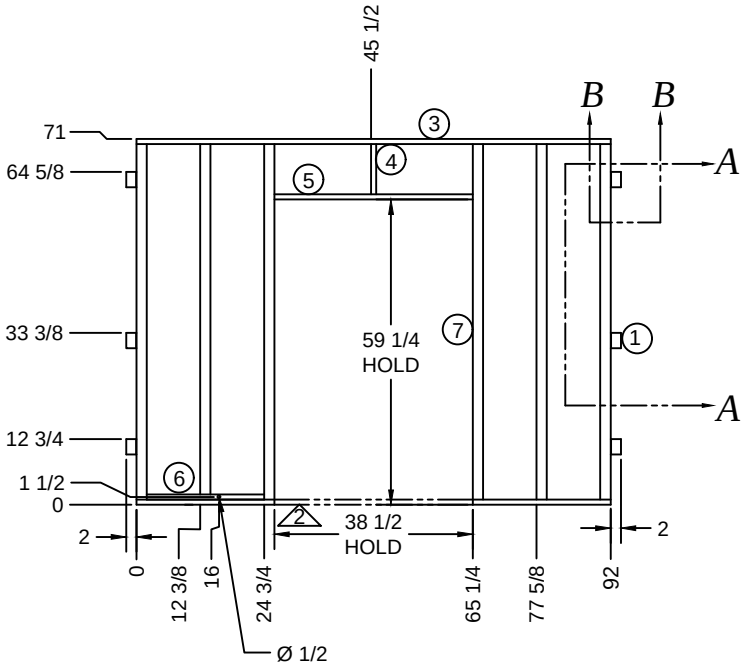
DATE: 6/13/18 NAME: MKLINE

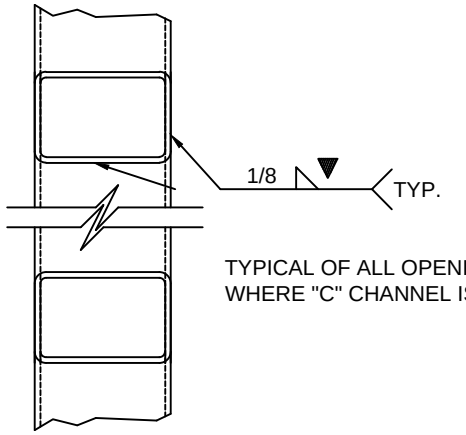
TITLE: 158" WB MODEL 24, DR. SIDEWALL, ALL PASS, RAISED FLOOR

DWG. No. 32-13-0002-10

CRITICAL CONTROL ITEM

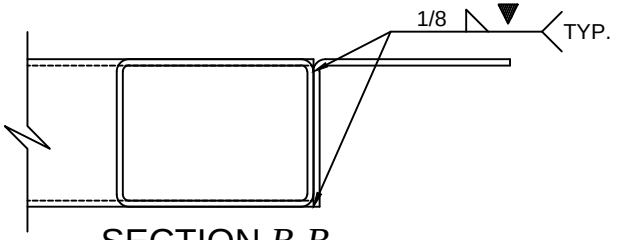
USAGE: Raised Floor w/ Rear Door, SPECIAL 1-1/2" THICK WALL





TYPICAL OF ALL OPENINGS
WHERE "C" CHANNEL IS USED

SECTION *A-A*



SECTION *B-B*

ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
7	6		TUBE: 16ga. x 1-1/2" x 2" x 69"Lg. A-513
6	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 10-3/8"Lg. A-513
5	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 38-1/2"Lg. A-513
4	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 9-3/4"Lg. A-513
3	2	02071055	TUBE: 16ga. x 1-1/2" x 1" x 92"Lg. A-513
2	0		
1	6		ANGLE: 16ga. x 1" x 2" x 6"Lg. A-513

NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2 2- REMOVE STEEL TUBE IN DOOR AREA AFTER WALL MOUNT TO FLOOR BUT BEFORE INSTALLING DOOR JAM ASSEMBLY.

Glaval Bus *a division of Forest River, Inc.*

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED
± .00 ± .030
± .000 ± .015
± .0000 ± .005

DATE: 06/14/18
DFTSN: MKLINE
CHKR:
APRVD:

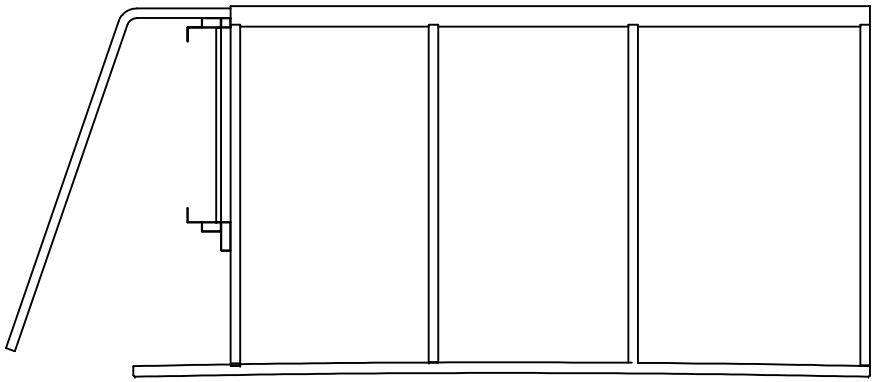
TITLE **Frame, Rear Wall Raised Floor With Door**

DWG. No. 31-28-0010-18 SPECIAL

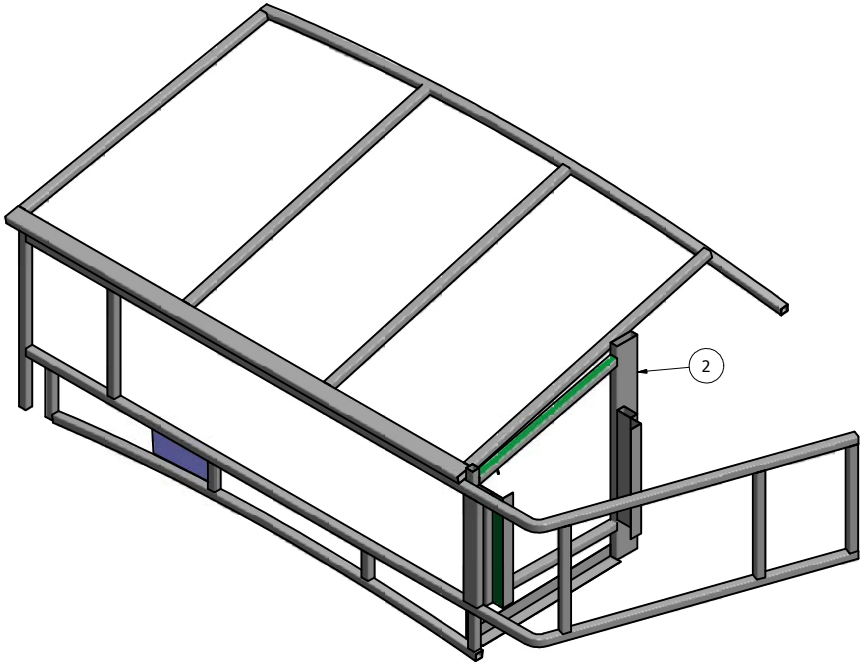
SCALE

DISK No.

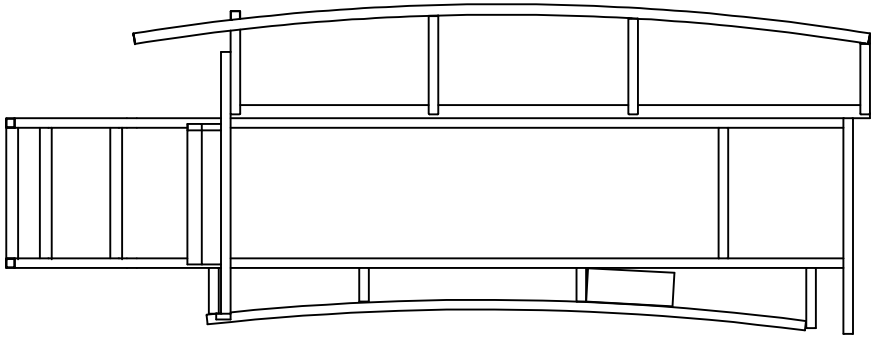
SHEET 1 OF 1



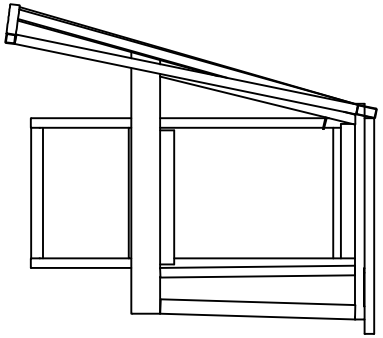
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



SIDE VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	31-28-0307-11	FORD Front Cab Wrap Around
2	1	31-28-0299-11	Ford Electrical Panel Frame
3	1	31-28-0745-11	FORD Cab Overhead

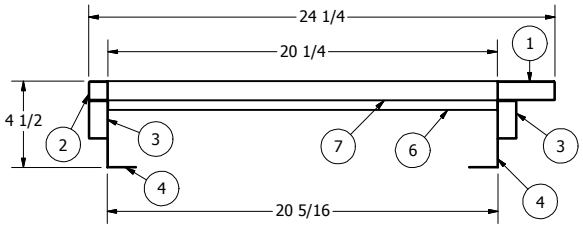
*****ALL MATERIALS GALVANIZED*****

Note:

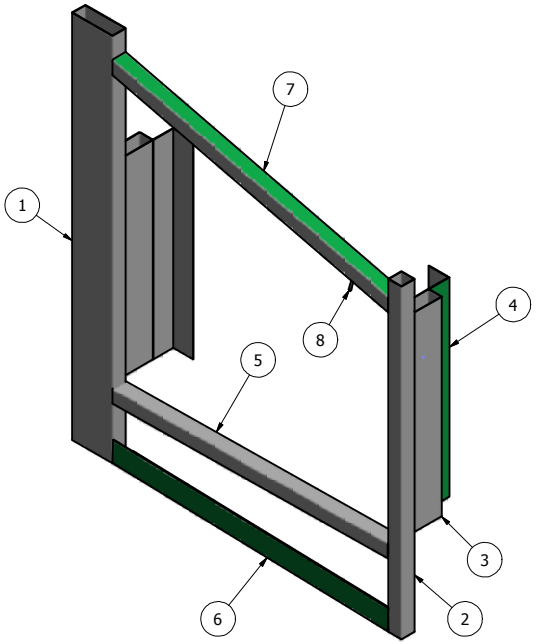
1). Viewed from Interior.

Glaval Bus
A Division Of Forest River, Inc.

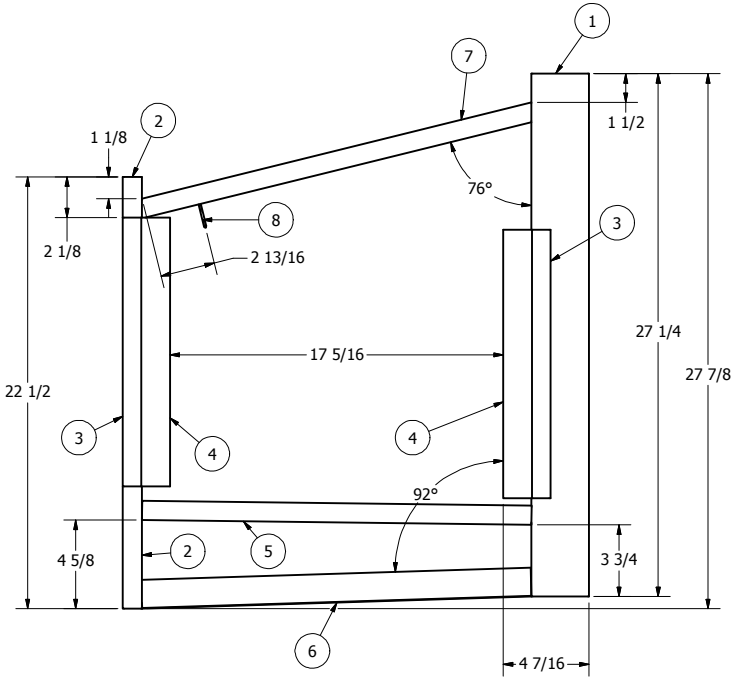
DFTSN:	TAS	TITLE	Ford Front Cab, Over Head Cab, Electrical Panel Assembly
DATE:	02/04/15	DWG NO	31-28-0993-15
		SHEET	1 OF 1



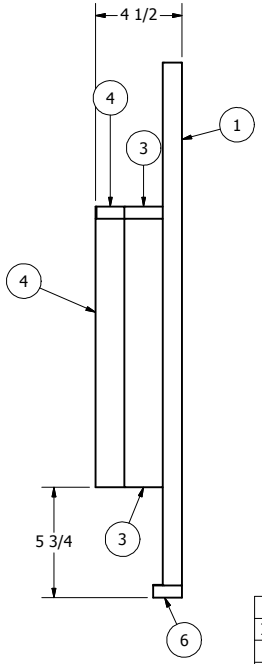
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



SIDE VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	1x3x27.25	Steel Tube 16ga. 1"x 3"x 27-1/4"
2	1	1x1x22.5	Steel Tube 16ga. 1"x 1"x 22-1/2"
3	2	1x2x14	Steel Tube 16ga. 1"x 2"x 14"
4	2	02071056-14	STEEL ANGLE 11ga.x 1-1/2"x 1-1/2"x 14" lg. A-513
5	1	1x1x20.25	Steel Tube 16ga. 1"x 1"x 20-1/4"
6	1	02071056-20.25	STEEL ANGLE 11ga.x 1-1/2"x 1-1/2"x 20-1/4" lg. A-513
7	1	1x1x21.125 Angle Cut	Steel Tube 16 ga. 1"x 1"x 15-1/4" Angle Cut
8	1	.25-20 x 1.25 Stud Grade 8	1/2" 13 x 2" Grade 8 Hex Head Bolt

*****ALL MATERIALS GALVANIZED*****

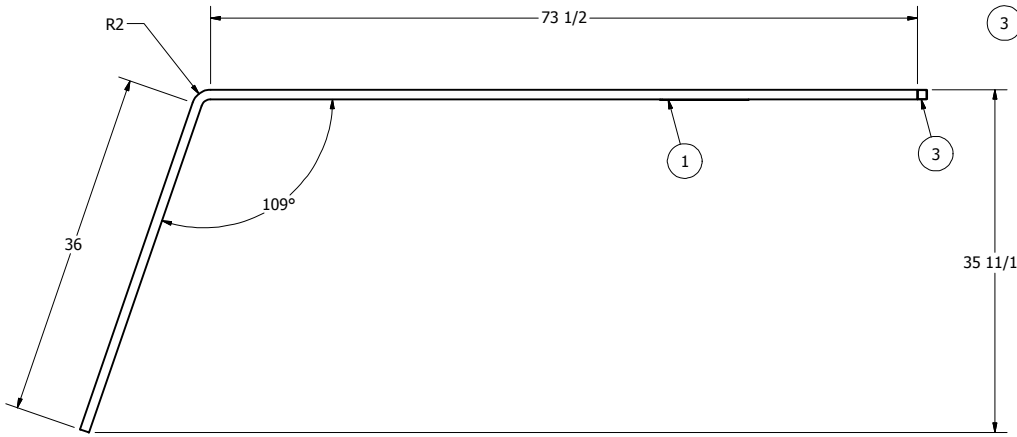
Note:

1). Viewed from Exterior.

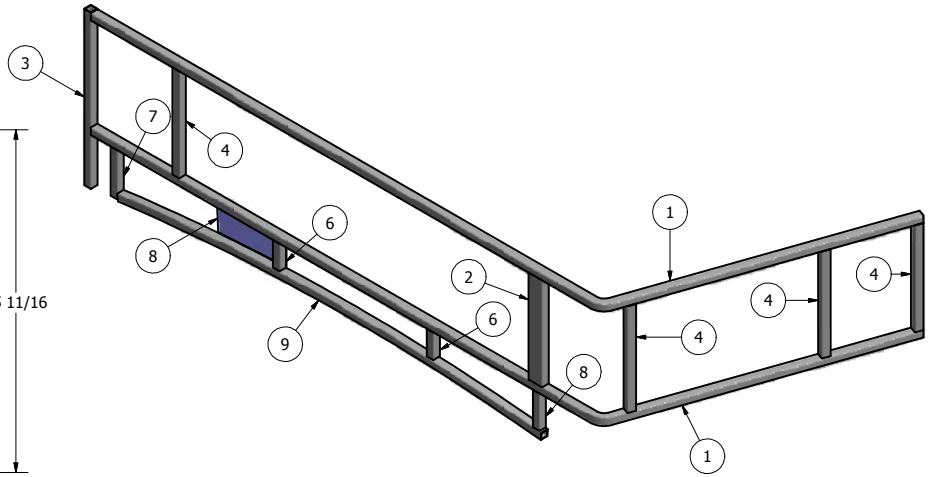
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	Released For Production	9/21/07	ELF
31-28	"B"	Update From Auto Cad To Inventor.. Updated To Match What Production Is Currently Building	11/14/07	TAS
31-28				

Glaval Bus
A Division Of Forest River, Inc.

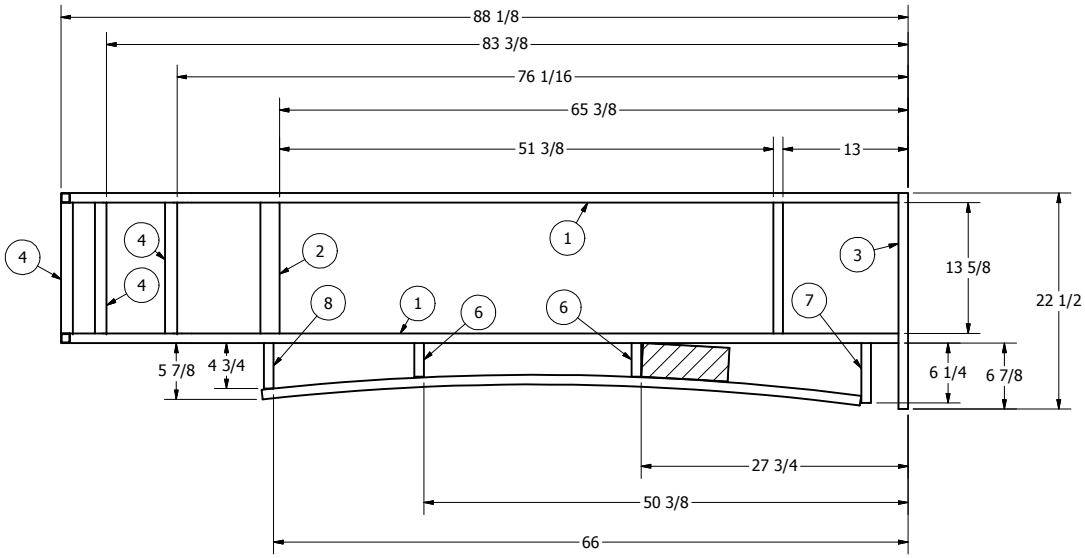
DFTSN: TAS	TITLE: Ford Electrical Panel Frame		
DATE: 11/07/11	DWG NO: 31-28-0299-11	SHEET 1 OF 1	



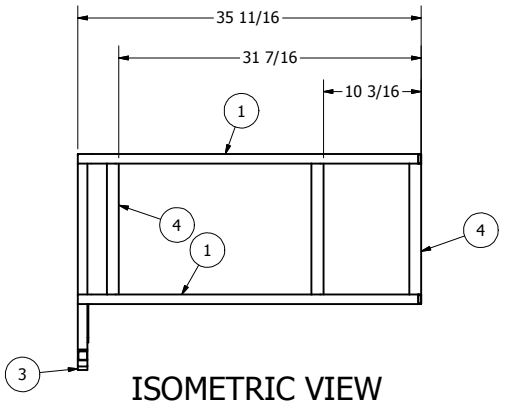
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



ISOMETRIC VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	31-28-0747-11	Ford 1"x 1"x 16ga. Front Wrap Steel Tube
2	2	1x2x13.625	Steel Tube 16ga. 1"x 2"x 13-5/8"
3	1	1x1x22.5	Steel Tube 16ga. 1"x 1"x 22-1/2"
4	5	1x1x13.625	Steel Tube 16ga. 1"x 1-1"x 13-5/8"
5	1	1x1x15.625	Steel Tube 16ga. 1"x 1"x 15-5/8"
6	2	1x1x3.5	Steel Tube 16ga. 1"x 1"x 3-1/2"
7	1	1x1x6.25	Steel Tube 16ga. 1"x 1"x 6-1/4"
8	1	1x1x4.75	Steel Tube 16ga. 1"x 1"x 4-3/4"
9	1	1 x1 66.25 CAB CURVE	Ford 1"x 1"x 62-1/4" Steel Cab Radius Tube
10	1	1x1x4.375	Steel Tube 16ga. 1"x 1"x 4-3/8"

*****ALL MATERIALS GALVANIZED*****

Note:

1). Viewed from Exterior.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	Release To Production	10/26/2007	ELF
31-28	"B"	Changed Length of The Wrap Around Tubes	04/28/09	MDK
31-28	"C"	Update From Auto Cad Ton Inventor.. Updated To Match What Production Is Currently Building	11/14/2011	TAS
31-28	"D"	New Reviesed Standard 2015 Halo	02/05/2015	TAS

Glaval Bus
A Division Of Forest River, Inc.

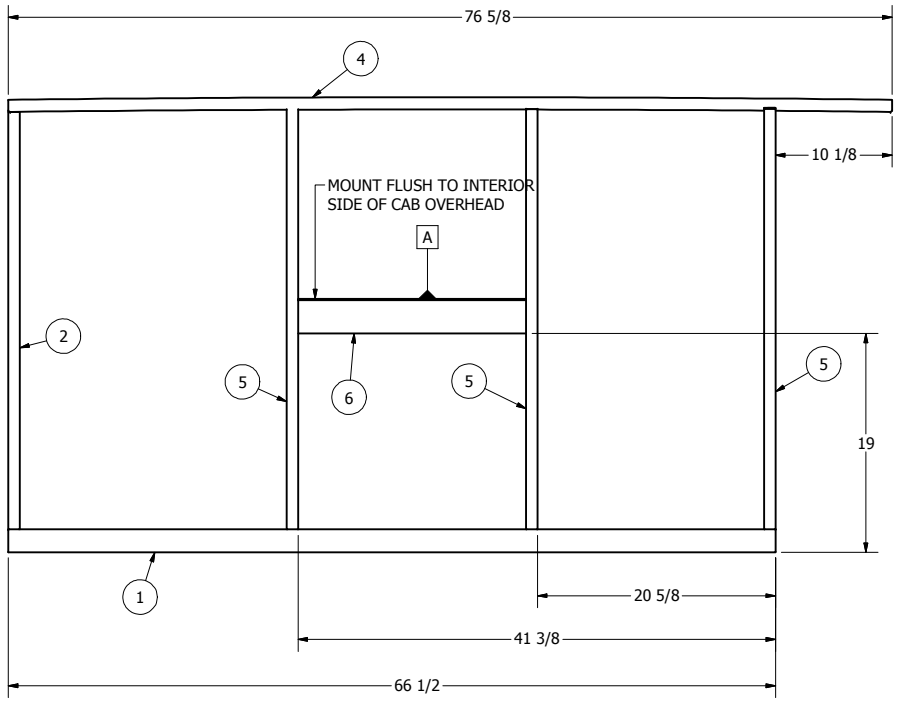
DFTSN: TAS

TITLE: FORD Front Cab Wrap Around

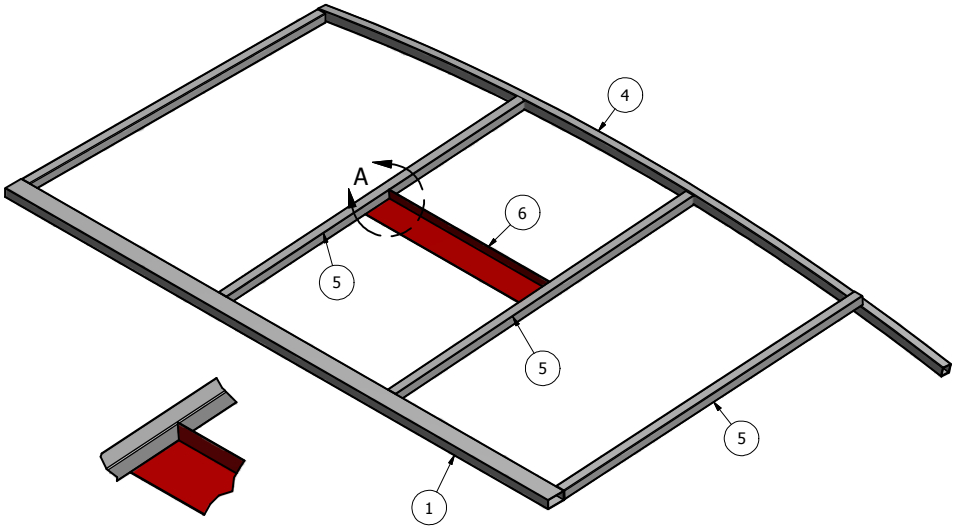
DATE: 11/07/11

DWG NO 31-28-0307-11

SHEET 1 OF 1

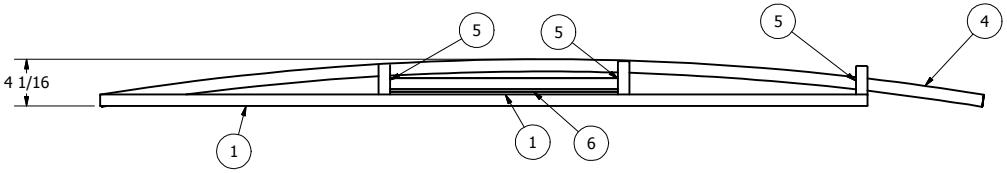


Top View

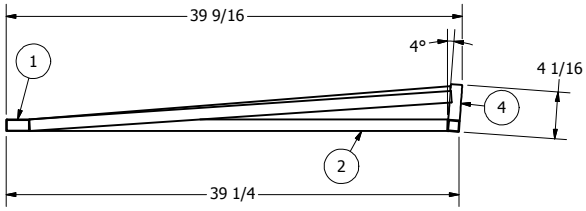


Isometric View

DETAIL A
SCALE 0.24 : 1



Front View



Side View

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	1x2x66.5	Steel Tube 16ga. 1"x 2"x 66-1/2"
2	1	1x1x36.25	Tube 16ga. 1"x 1"x 36-1/4"
3	1	1x3x7	Steel Tube 16ga. 1"x 3"x 7"
4	1	31-28-0750-11	Ford Allstar Radius Tube 1"x 1"x 76-5/8"
5	3	1x1x36.625	Aluminized Steel Tube 16ga. 1"x 1"x 36-5/8"
6	1	3 x 1x 19.75	STEEL ANGLE 16ga.x 3"x 1"x 19-3/4" lg. A-513
11	1	3 x 1x 19.75	STEEL ANGLE 16ga.x 3"x 1"x 19-3/4" lg. A-513

Note:

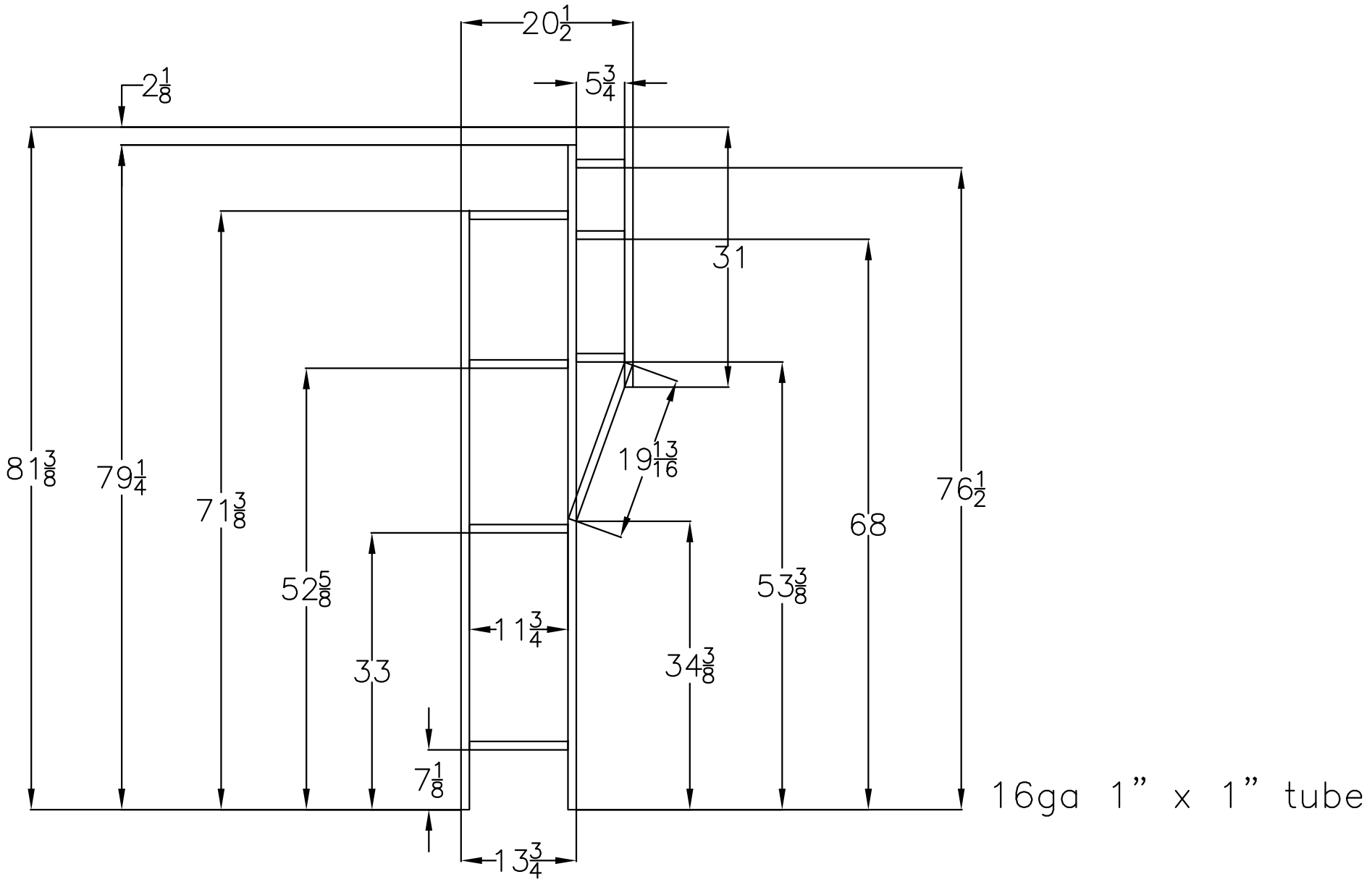
1). Viewed from Exterior.

*****ALL MATERIALS GALVANIZED*****

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	ADDED ANGLE FOR BACKER CENTER CEILING STRIPE	3/22/2015	TAS

Glaval Bus
A Division Of Forest River, Inc.

DFTSN:	TAS	TITLE	FORD New Syle Cab Overhead
DATE:	11/07/11	DWG NO	31-28-0745-11
		SHEET	1 OF 1



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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

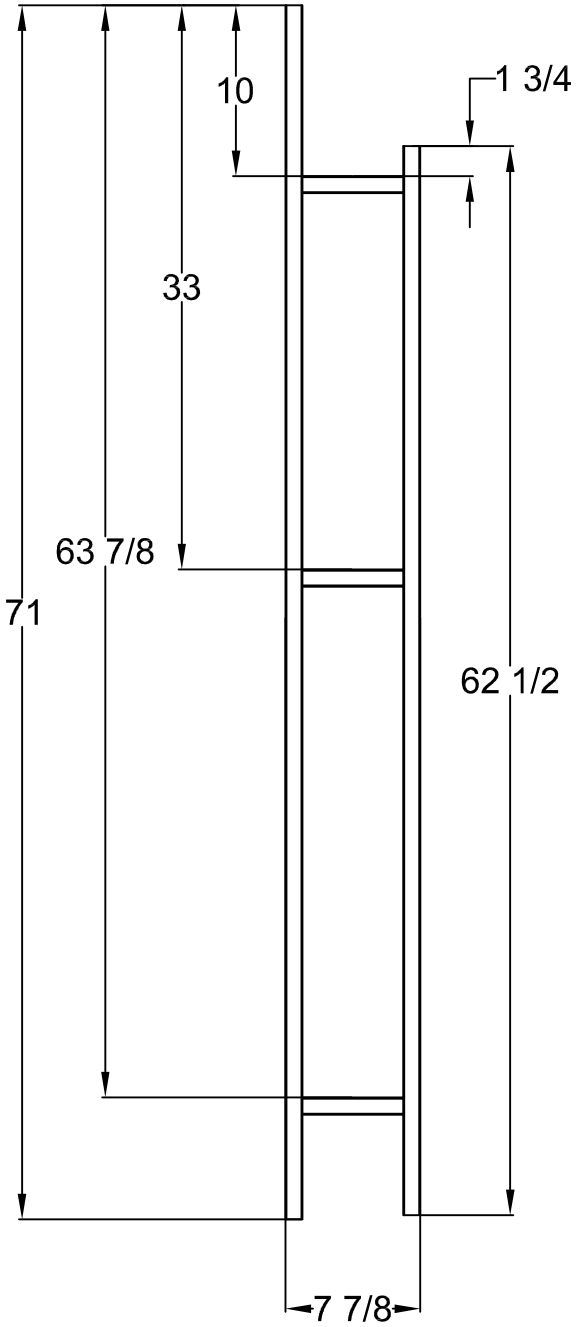
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

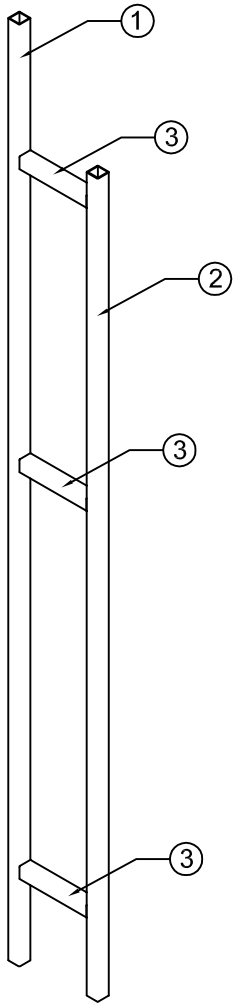
Glaval Bus *a division of Forest River, Inc.*

DATE: 7/27/17 NAME: MK

TITLE: **streetside pillar**

DWG. No. 31-28-0955-14





16ga 1" x 1" tube

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

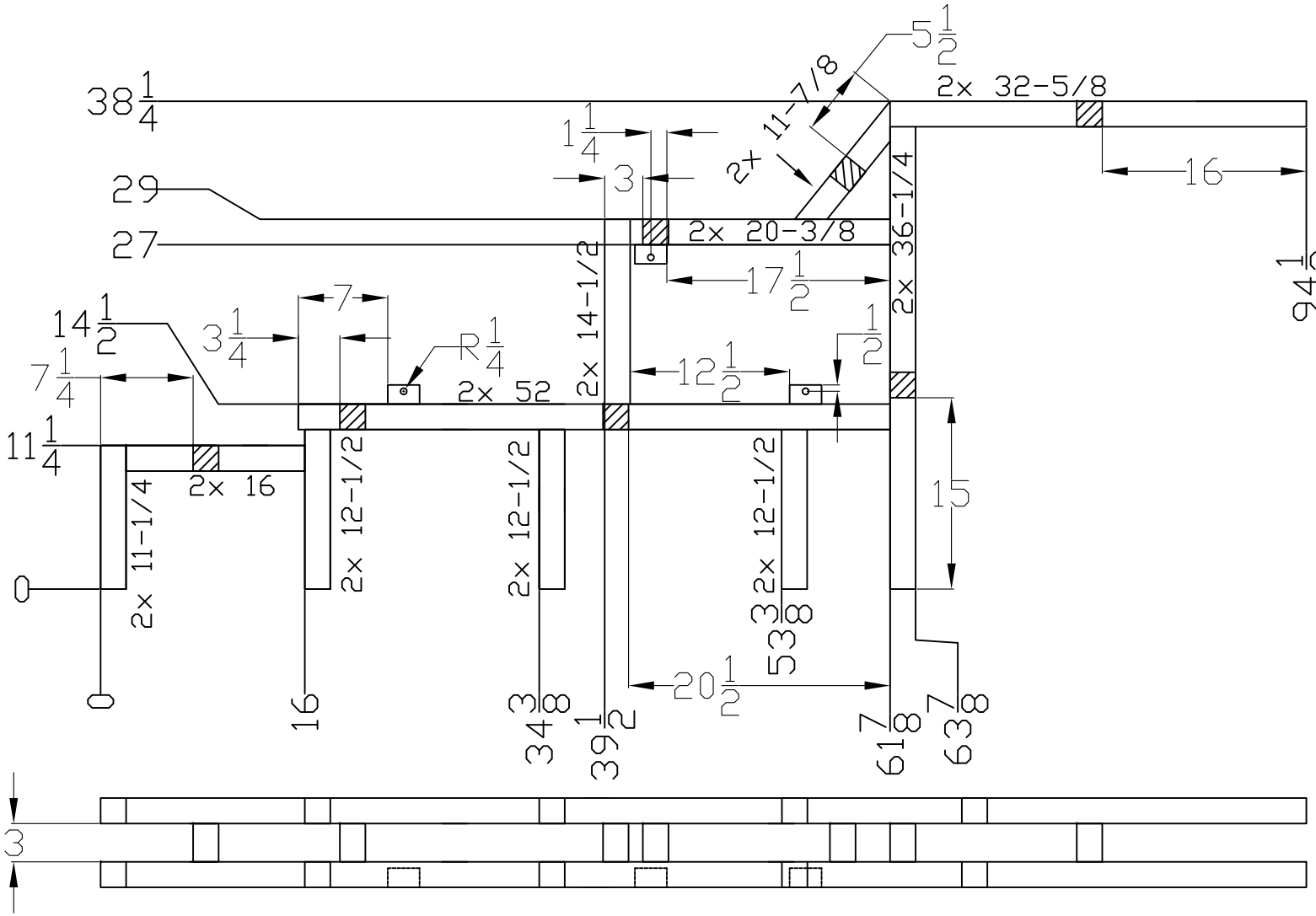
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

DATE: 7/27/17 NAME: MK

TITLE: curbside pillar

DWG. No.



MAT'L=2" x 2" x 16GA.

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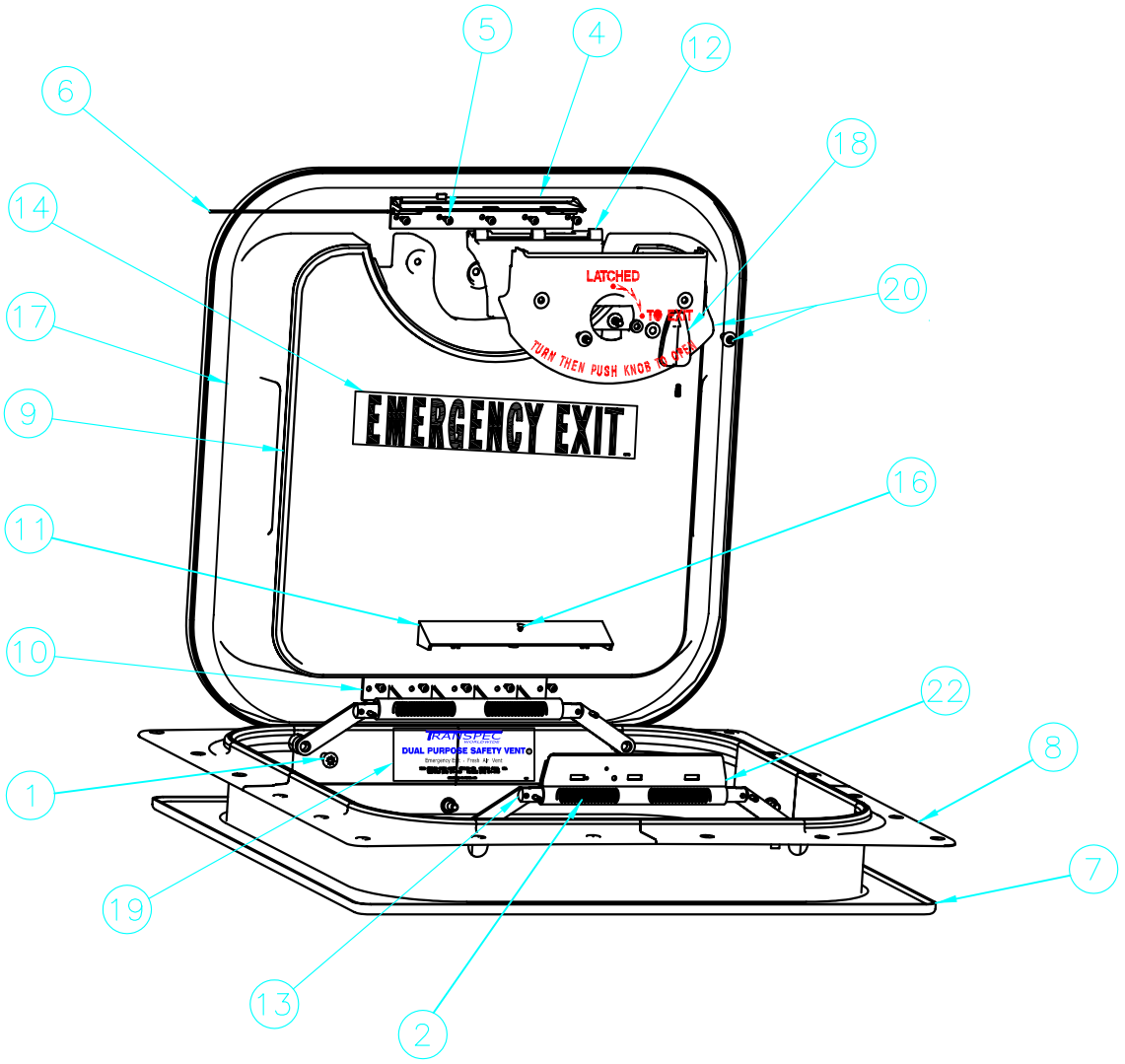
REV. LET.	DESCRIPTION OF CHANGE	BY	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

Glaval Bus a division of Forest River, Inc.

DATE: 06/30/17
NAME: RTS
TITLE: RAISED FLOOR-3 STEP FALSE FLOOR ASSEMBLY
DWG. No. 31-28-0531-17C



	ITEM NO.	PART NO.	DESCRIPTION	QTY.
	1	2030	SHOULDER BOLT	4
	2	2040	PLUNGER SPRING	4
*	4	2070	HANDLE BASE WHITE	1
*	5	2100	SPECIAL SCREW, TORX HI-LO	10
*	6	2140	HINGE PIN	1
	7	2220-4-001	TRIM MOLDING #4 WHITE TRIMMED	1
	8	2250	FRAME #4 LOW PROFILE WHITE	1
*	9	1075	LID DUAL PURPOSE SAFETY VENT II WHITE	1
*	10	2050	FIXED HINGE WHITE	1
*	11	2055	HINGE COVER WHITE	1
*	12	1000-003	RELEASE HANDLE ASSY. WHITE	1
	13	1000-005	LINK & PLUNGER ASSY.	4
*	14	2572	DECAL EMERGENCY EXIT	1
*	16	2105	SCREW #8 x 1/2 S/S FLAT HEAD	1
*	17	1000-017	EXTRUDED GASKET KIT	1
*	18	1077-014	RELEASE ASSEMBLY INNER	1
	19	2670	DECAL-DUAL PURPOSE SAFETY VENT II	1
*	20	1975-015	RELEASE HINGE SHIELD ASSY. WHITE	1
	22	2060	RELEASE HINGE WHITE	1

	ASSEMBLY #	REPLACEMENT LID ASSEMBLIES (*)	QTY.
	1075L-000-001	LID ASSEMBLY DPSV WHITE	

(*) Lid with fixed hinge, release hinge, handle, gasket and decals

REV	DESCRIPTION	DATE	BY	APV'D

MATERIAL: SEE DETAILS

DR. PHENG LEE | DATE 01/29/04

TOLERANCE:
UNLESS OTHERWISE SPECIFIED
INCH: .X=±.020 .XX=±.010 .XXX=±.005
METRIC: .X=±.5MM .XX=±.25MM .XXX=±.13MM
ANGLES=±1°

ENGR. R.J.IMINSKI | SCALE NONE

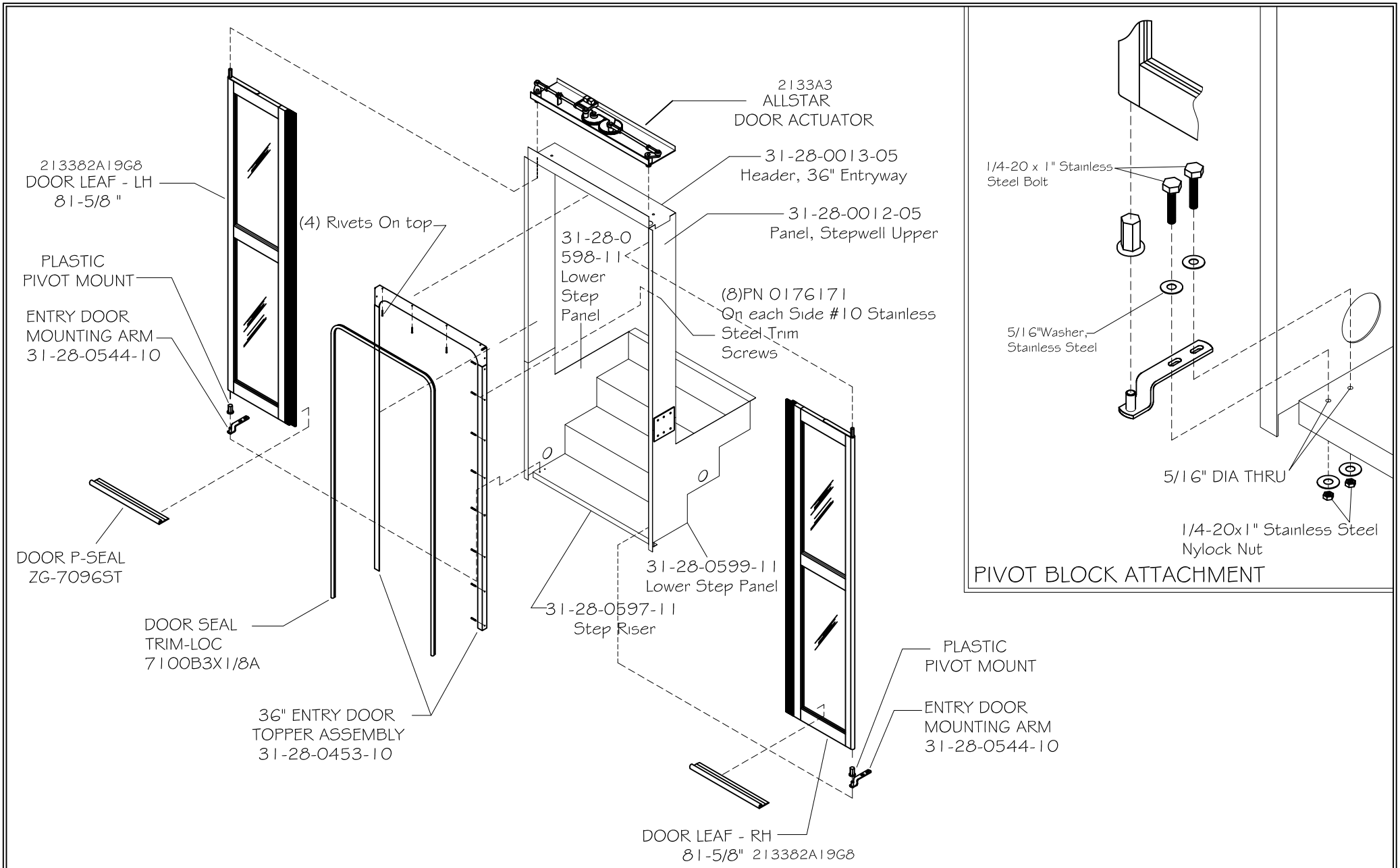
TRANSPEC WORLDWIDE
7205 STERLING PONDS COURT
STERLING HTS MICHIGAN 48312 USA

DUAL PURPOSE SAFETY VENT II
#4 SWEEP, ENGLISH, WHITE

FIRST USED ON: NP-161

PART NO. 1075-004-001

ASAP



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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.
A	MODIFIED EDT DRAWING OF A STANDARD FLOOR	MDK		2/25/13	

Forest River Bus Divisions

TOLERANCE UNLESS OTHERWISE SPECIFIED
± .00 ± .030
± .000 ± .015
± .0000 ± .005

DATE: 2-25-13
DFTSN: MDK
CHKR:
APRVD:

TITLE: INST'L 36" ENTRYWAY
RAISED FLOOR ALLSTAR

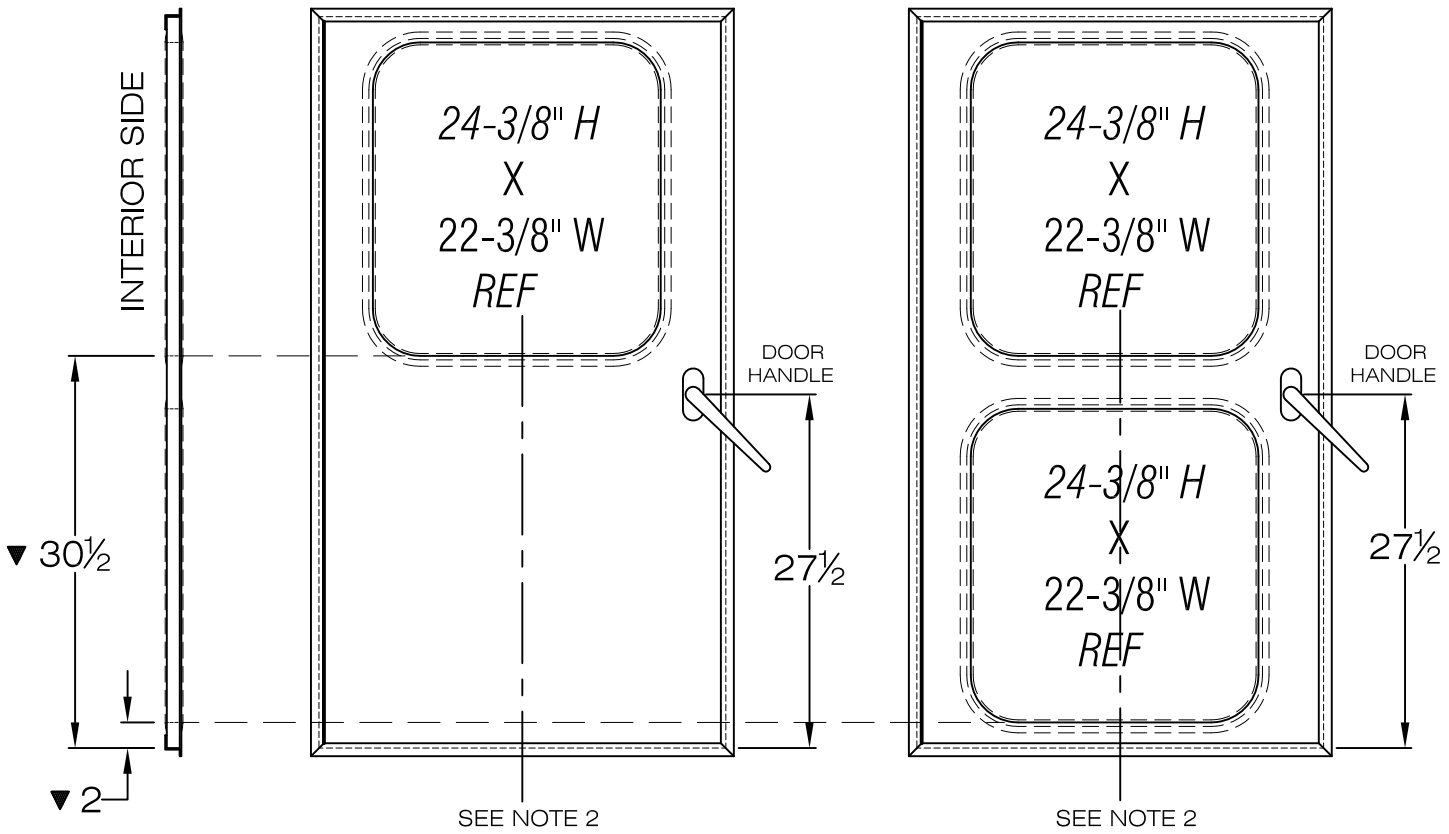
SCALE
DISK No.

DWG. No. 31-28-0880-13
SHEET | OF |

REAR DOOR

SINGLE WINDOW

DOUBLE WINDOW



REAR DOOR ROUGH FRAME OPENING 38-1/2" X 59"

NOTES:

1- DIMENSIONS FOR THE WINDOW CUTOUT DO NOT INCLUDE DOOR OR WINDOW TRIM.
2 - CENTER WINDOW HORIZONTALLY IN DOOR.
3 - TWO (2) PANELS ARE REQUIRED FOR W/C DOOR.

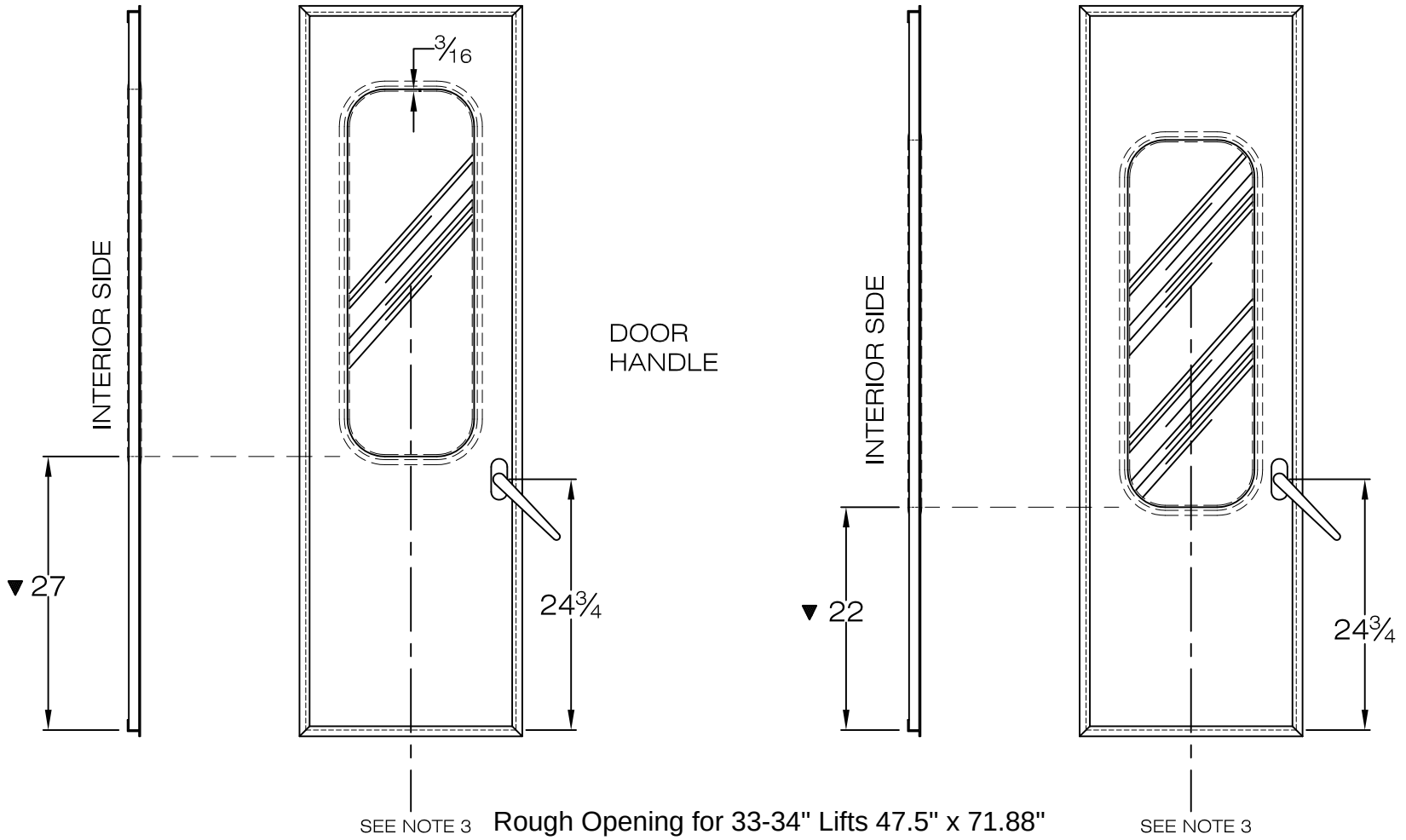
▼ CRITICAL CONTROL ITEM

CAD DRAWING: DO NOT SCALE OR MANUALLY REVISE

TOLERANCE UNLESS OTHERWISE SPECIFIED		Forest River Bus	
WOOD	OTHER	DATE: 4-6-2006	TITLE: LOCATION, RR DR WINDOW
± 1/8"	± 1/16"	NAME: ET	
± 1°	± 1/2°	DWG. No. 31-28-0108-06	

STANDARD WIDE BODY BUS

NARROW BODY BUS AND
RAISED FLOOR WIDE BODY BUS



Rough Opening for 33-34" Lifts 47.5" x 71.88"
Rough Opening for 37" Lifts 49.9" x 71.88"
Offset hinges are utilized, maximizing clear opening available.

NOTES:

1- DIMENSIONS FOR THE WINDOW CUTOUT DO NOT INCLUDE DOOR OR WINDOW TRIM.
2 - 36 1/4" X 12 1/2" ROUGH WINDOW OPENING
3 - CENTER WINDOW HORIZONTALLY IN DOOR.

▼ CRITICAL CONTROL ITEM

CAD DRAWING: DO NOT SCALE OR MANUALLY REVISE

TOLERANCE UNLESS OTHERWISE SPECIFIED		Forest River Bus	
WOOD	OTHER	DATE: 3-8-06	TITLE: LOCATION, W/C DOOR WINDOW
± 1/8"	± 1/16"	NAME: EDT	
± 1°	± 1/2°	DWG. No. 31-28-0105-06	

PRETORIA

Energy Absorbing Bumpers for Today's Mid Size and Heavy Duty Buses

SMI Energy Absorbing Bumpers are made with an ultra, high strength "pultruded" back up structure. Corrosion resistant material ensures long life, even when subjected to harsh weather conditions and road salt. Our energy absorbing bumper is interchangeable for the, left or right side. Designed with fewer parts and less weight for Improved performance and quick installation.

Two Piece Construction
Reduces Inventory Requirements and Cost
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Long Life Corrosion Resistance
Sleek, Modern Appearance
Range of Widths from 80" to 102"

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2018 Product Application Guide • 3-7-18

NCL1000-2 CENTURY SERIES™

NCL1000-2 Century Series™ Features

- Fully automatic NHTSA compliant lift, operated by an attendant
- Loading position - either direction
- Interfaces with OEM interlocks
- Lift mounted lights - platform illuminated as it deploys
- Hand control with illuminated functions
- Locking mechanical Inboard Barrier (IB), powder coated yellow for safety and high visibility, prevents movement if occupied
- Pump design prevents platform folding when occupied, quiet operation and low current draw
- Durable redesigned baseplate reduces lift weight and allows for quicker and easier service of hose/wiring
- Easily installed, step-by-step installation instructions, no peripheral hardware required
- Visual and audible warning provides notification of unsafe conditions
- Spring-loaded outer barrier that will transition to the fully up position as the platform leaves the ground, has durable rubber nose guard and is powder coated yellow for safety and high visibility
- Parallel arms lift with hydraulic cylinders
- Side or rear door application
- Several platform widths and lengths
- Dual handrails for security and convenience
- Bridging feature permits the wheelchair user to board the lift from sidewalks or inclines
- Floor to ground travel is 48”
- Lifting capacity is 1000 lbs
- Integrated back-up pump
- Equipped with an adjustable anti-rattle feature to avoid unpleasant noise in the vehicle during transit
- Durable high-gloss powder coated finish
- Lift-Tite system stows the lift platform securely while the vehicle is in transit
- Pump module with removable cover offers easy access to all components

NCL1000-2 Century Series™ Models

NCL1000IB3351-2
NHTSA Compliant **Usable Platform: 33" x 51"**

NCL1000IB3451-2
NHTSA Compliant **Usable Platform: 34" x 51"**

NCL1000IB3451HB-2
NHTSA Compliant **Usable Platform: 34" x 51"**

NCL1000IB3454-2
NHTSA Compliant **Usable Platform: 34" x 54"**

NCL1000IB3454HB-2
NHTSA Compliant **Usable Platform: 34" x 54"**

NCL1000IB3751HB-2
NHTSA Compliant **Usable Platform: 37" x 51"**

NCL1000IB3754HB-2
NHTSA Compliant **Usable Platform: 37" x 54"**

For a front-mounted pump assembly, add "F" to the model number when ordering (example: NCL1000FIB3351-2).

IB = Inboard Barrier HB = Handrail Belt

General Function: Electrohydraulic, power up/gravity down operation

Operation: Hydraulic pump with two lifting cylinders

Control: hand-held control box

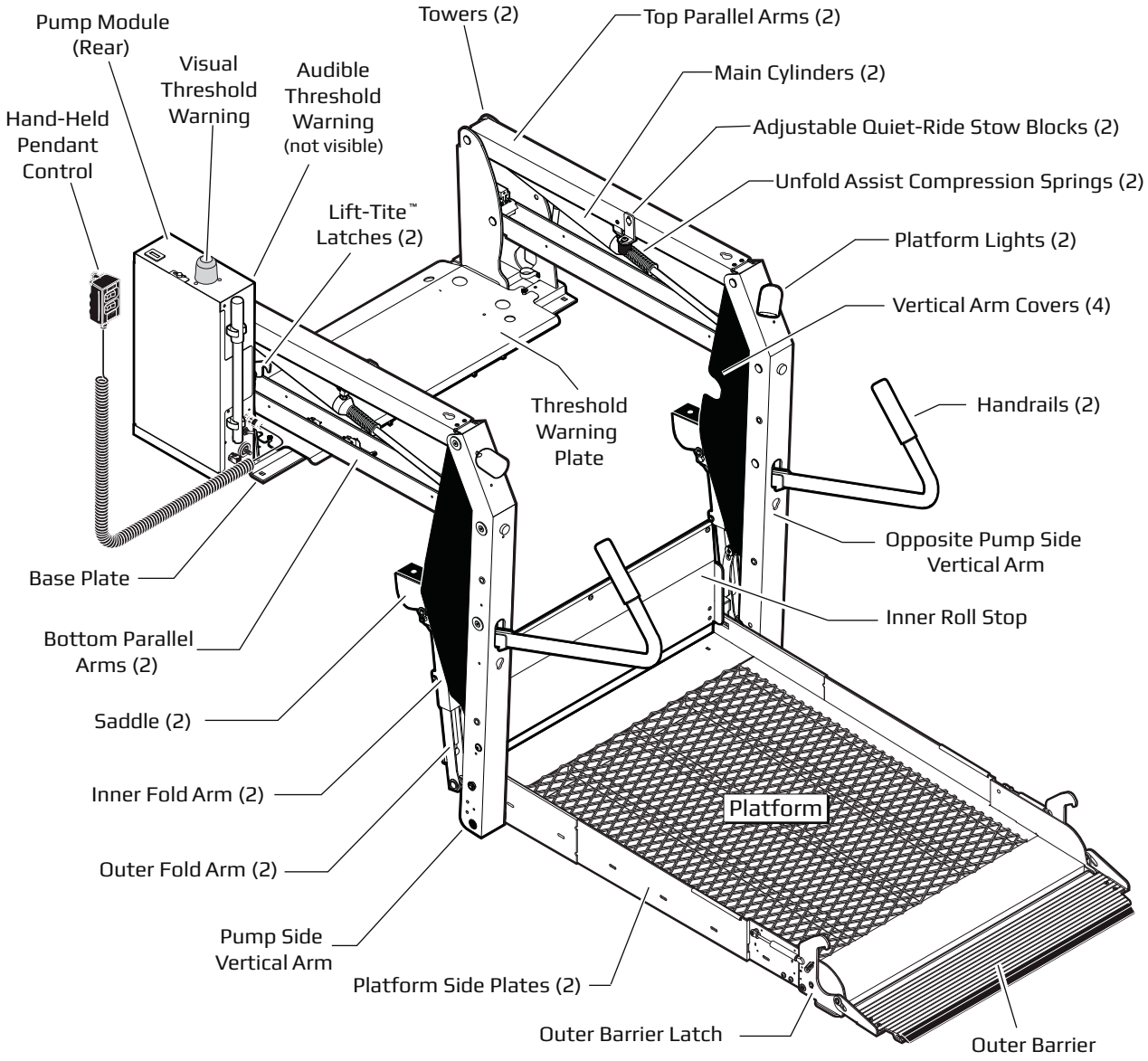
Hydraulic: Pressure Max. 2,495 psi, Fluid is Univis HVI 26, oil reservoir is .33 gal

Construction: Steel structure with powder coat finish

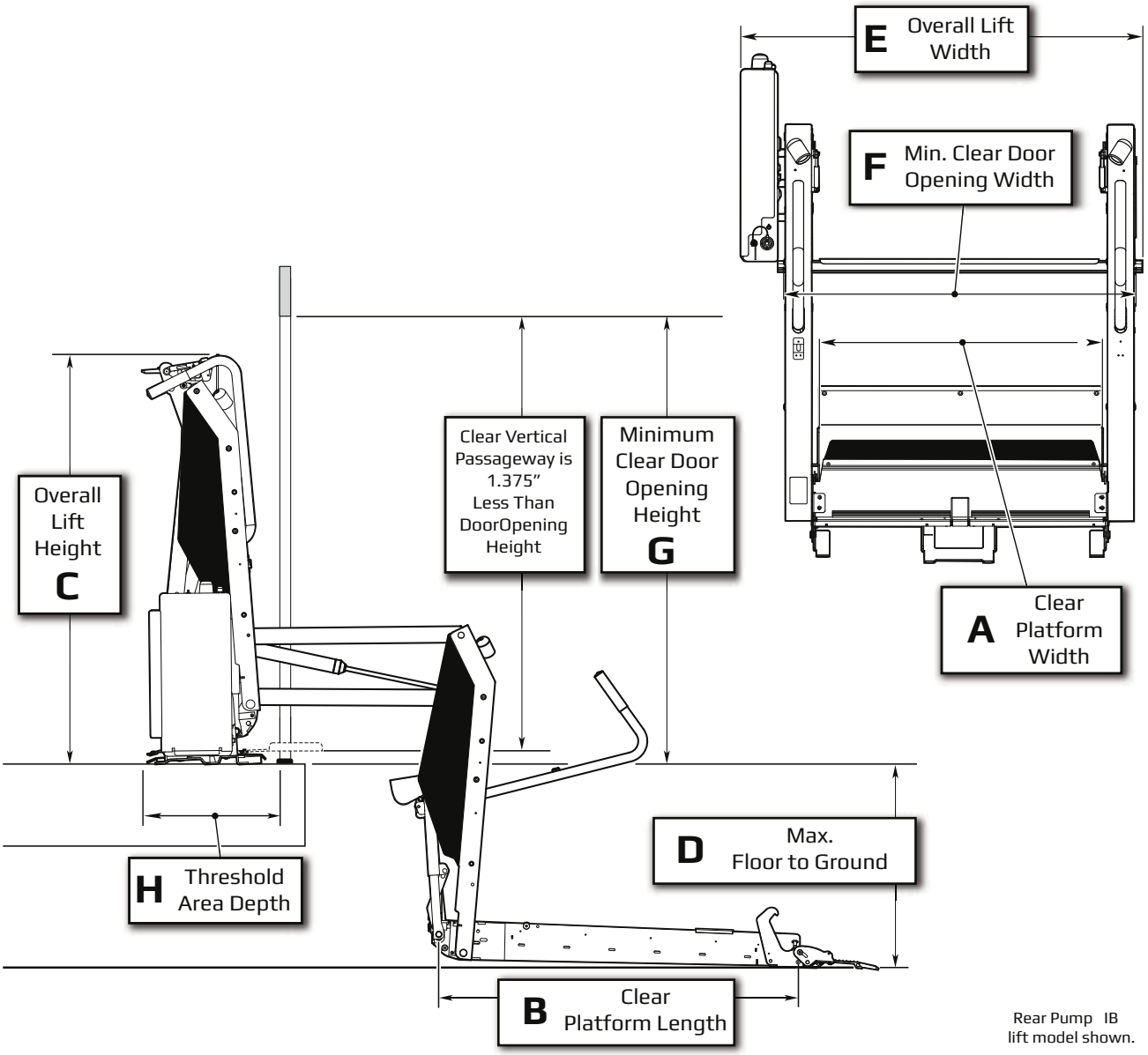
Operating Temperature: 0ºF to 140ºF

Power Supply: 12VDC

Current Consumption: Max. 70A (12V)



NCL1000-2 Century Series™ Dimensions



Rear Pump IB lift model shown.

All dimensions are for reference only.

NCL1000-2 Century Series™			A	B	C	D	E	F	G	H
Lift Model Number	Lift Weight lbs	Lifting Capacity lbs	Clear Platform Width	Clear Platform Length	Overall Lift Height	Max. Floor to Ground	Overall Lift Width	Min. Clear Door Opening Width	Min. Clear Door Opening Height	Threshold Area Depth
NCL1000IB3351-2	358	1000	33"	51"	56.25"	48"	46"	42"	57.375"	18"
NCL1000IB3451-2	358	1000	34"	51"	56.25"	48"	47"	43"	57.375"	18"
NCL1000IB3451HB-2	358	1000	34"	51"	61.25"	48"	47"	43"	62.375"	18"
NCL1000IB3454-2	358	1000	34"	54"	59.25"	48"	47"	43"	60.375"	18"
NCL1000IB3454HB-2	358	1000	34"	54"	66.25"	48"	47"	43"	67.375"	18"
NCL1000IB3751HB-2	380	1000	37"	51"	61.25"	48"	50"	46"	62.375"	18"
NCL1000IB3754HB-2	385	1000	37"	54"	66.25"	48"	50"	46"	67.375"	18"

NCL1000-2 Century Series™ NHTSA Installation Kits

	Std. Length Rear Door	Ext. Length Rear Door
Ford Transit (2015)	**400774KS**	**400773KS**
Ford Transit Template (2015)	**400778KS**	**400778KS**
Sprinter (2014 & up)		**401174KS**
Sprinter Template (2014 & up)		**401177KS**

Van Mounting Kits contain floor reinforcements for 403/404 compliance.

NCL1000-2 Century Series™ Accessories

31579KS
Handrail Restraint Retractable - for 51" Platforms

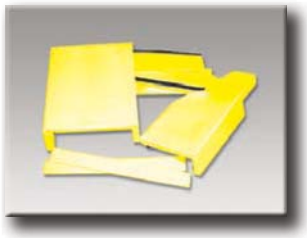
35533KS
Handrail Restraint Retractable - for 54" Platforms

35331KS
Handrail Restraint Non-Retractable

35295K
Upper Tower Support Kit

33659KS
Replacement Hand-Held Control

23708A913
"Full Curtain" Lift Cover (NCL917-2)



402605KS
Padding Kit NCL2 Series

NCL1000-2 Century Series™ Specifications

COMMERCIAL WHEELCHAIR LIFT SPECIFICATIONS - IN COMPLIANCE WITH United States Department of Transportation Rules and Regulations 49CFR, Part 38. FROM THE AMERICANS WITH DISABILITIES ACT OF 1990 and NHTSA Rule 403 (2004) "Provided to make your spec writing easier."

The wheelchair lift is compliant with Federal Motor Vehicle Safety Standard 403 for platform lift systems for motor vehicles. The lift shall have been tested to a minimum static load of 2400#. The lift shall have 1000# rated lifting capacity. The base plate shall be a corrugated designed member to provide rigidity to minimize lift deflection when placed under load.

The power supply shall be a 12 volt electro-hydraulic system operating two single-acting cylinders. The hydraulic power pack system shall be of modular design allowing for easy removal and field replacement, if needed. The operation of the unit shall provide a smooth, jerk-free ride in both up and down directions. The power operation of the hydraulic cylinders shall be of a pull-type design for smooth lifting operation and improved synchronous arm movement. The pivot pins in the trunnion (knuckle) of the pivot arms shall be of stationary design. The hydraulic system shall be regulated by two separate relief valves, one of which is designed to prevent accidental stowing when occupied.

The hand control for lift operation shall be of a one-hand operation design made of durable plastic. The hand control will provide user with illuminated functions. The hand control cable shall be coiled with quick-change connections for ease of maintenance or field change.

A manual back-up system shall be provided to ensure operation of the lift in case of electrical failure. The back-up system shall provide a reliable means of manually raising and lowering the lift while occupied. The back-up system shall fold and unfold the platform. The back-up pump shall be integrated with the hydraulic power pack system such that no hydraulic lines or fittings are required.

The platform shall be of steel construction and the surface shall be of see-through grating allowing for improved visibility and safer use in inclement weather. The platform shall have a minimum usable wheelchair passageway width of 33 inches and a minimum usable length of 51 inches requiring a 57 inch vertical clear door opening. The sides of the platform shall be a minimum of 2.5 inches high.

The platform shall be automatically folded and unfolded and fully automatic in operation. The platform shall allow both inboard and outboard facing of wheelchair and mobility aid users. The platform entrance ramp shall be extruded aluminum for weight savings, have a rubber leading edge and raised ribs for traction. The outer barrier must not raise if occupied with 25 lbs. The outer barrier shall be the sole outboard wheelchair retention device and shall be interlocked and comply with the FMVSS 403 requirements. Dual handrails shall be provided to add security and convenience. These handrails shall be 1.25 inch minimum diameter, minimum 30 inches in height, minimum of 8 inches in length, and withstand a 100# force in any direction (including vertical) without permanent deformation. The lift must have a fail safe system to prevent stowing if solenoid welds. The platform shall have "built in" lighting to meet 404 platform lighting requirements with no auxiliary lighting.

All lift components shall be finished with a baked-on powder coating, which will meet a salt spray test of 1000 hours, to provide corrosion resistance and a long service life. BraunAbility Century Series to include but not limited to the following model numbers:

- NCL1000IB3351-2, NCL1000FIB3351-2, NCL1000IB3451-2, NCL1000FIB3451-2, NCL1000IB3451HB-2, NCL1000FIB3451HB-2, NCL1000IB3454-2, NCL1000FIB3454-2, NCL1000IB3454HB-2, NCL1000FIB3454HB-2, NCL1000IB3751HB-2, NCL1000FIB3751HB-2, NCL1000IB3754HB-2, NCL1000FIB3754HB-2

BraunAbility
Life is a Moving Experience®

braunability.com 800.THE.LIFT ISO 9001:2008

631 West 11th Street, Winamac, IN 46996, USA

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ILIS-C

Wheelchair Lift Interlock
School Bus & Light Weight Vehicles

FEATURES & BENEFITS

- Meets ADA Title 49 & FMVSS 403/404 Lift Interlock requirements
- Fully automatic lift interlock system
- Lift can be operated from outside of vehicle with key off
- Prohibits lift operation anytime the vehicle is unsecured
- Dash-mounted LED panel displays system status
- Prevents driving vehicle with parking brake accidentally left on or lift door open
- "Plug & Play" harness connectors to Ford & Chevy chassis; no cutting of factory wires
- Patented solid state, microprocessor controlled unit
- CPU performs self-diagnostics every time vehicle is started
- Intermittent Fault Filter® (IFF) technology; filters out erroneous changes in sensor signals
- Compact unit is easy to install
- U.S. Patent No's. 6,594,565 / 6,965,819 / 7,274,980

STANDARD ILIS-C LED PANEL

ILIS-C DOOR AJAR LED PANEL

ILIS-C MODULE

INTERMOTIVE VEHICLE CONTROLS

An ISO 9001:2008 Registered Manufacturer

www.InterMotive.net 800-969-6080

NFPA MEMBER MVP

Rev. C

made in USA

TECHNICAL DATA SHEET

PROAIR™ LLC

COMPONENT SPECIFICATIONS

ProAir 435 / 445 / 465 Low Profile Heaters

Where a smaller height is required and high heat is of utmost importance the 435,445 and 465 Low Profile auxiliary heaters deliver maximum BTUs with outstanding CFMs.

Features: Long Life Motor, 3 Year Warranty, Standard Plug-In on Harness and Filter Option Available

435 /445 Heater Performance

35,000 Btu/hr 435 Heater and 45,000 Btu/hr 445 Heater Capacity

Power Requirement

12 Volts DC
Draw is 5.0 Amps @ 13.5 Volts

Air Flow

313 CFM @ 0 static Pressure

Weight

8 Lbs. 435 Heater 9 Lbs. 445 Heater

Physical Size

W 10.25"x H 7.5"x D 9.5"

465 Heater Performance

65,000 Btu/hr Heating Capacity

Power Requirement

12 Volts DC
Draw is 10.0 Amps @ 13.5 Volts

Air Flow

640 CFM @ 0 static Pressure

Weight

15 Lbs.

Physical Size

W 21"x H 7.5"x D 9.5"

Warranty ProAir systems are covered by an industry-leading two-year warranty. Complete terms are outlined in our Warranty Statement, Consult ProAir for detailed information.

Air Conditioner

R476021

Up to 89,000 BTU/hr in a Single Circuit Evaporator

ACC CLIMATE CONTROL
A SPHEROS COMPANY

23047 Evaporator
- Up to 75,000 BTU/hr
- (2) dual blower assemblies @ 1600 cfm
- 30 amps @ 12 vdc
- 65 lbs

25060 Condenser
- 100,000 BTU/hr
- (2) 14 inch fans
- 22 amps @ 12 vdc
- 56 lbs

ATCO Hose System
- ATCO 3800 Barrier Hose
- ATCO a/c Series Hybrid Elastomer Fittings
- Use with PAG oil
- Meets SAE-J2064 Specifications

TM-21 Compressor
- 13.1 cubic inch displacement capacity
- 3 amps @ 12 vdc

R476021 – Up to 90,000 BTU/hr in a Single Circuit Evaporator

The R476021 consists of (1) 23047 Rear Mount Evaporator, (1) 25060 skirt mount condensers with (1) TM-21 compressors, and is rated up to 75,000 B TU/hr. (plus the OE Dash a/c capacity). The system is equipped with an orifice tube/accumulator designed for prolonged service life.

The simplified relay board provides system operation with ground leg switching. LEDs for each circuit provide for easy diagnostics of electrical continuity. Parallel flow condensers provide for lighter weight and higher efficiencies over copper tube condensers.

Combined with the OE package, the total system capacity rating up to 90,000 BTU/hr.

R476021 – Up to 90,000 BTU/hr

AIR CONDITIONING SPECIFICATION

Model R476021

This air conditioning system shall be a Model **R476021**.

Compressor: (1) TM-21 Compressors in addition to the OE Chassis supplied compressor driven off the vehicle engine.

Evaporator: One (1) Model 23047 free blow evaporator rated up to 75,000 BTU/hr. The evaporator shall have two (2) dual shaft blower assemblies. The motor is minimum three (3) speed continuous duty permanent magnet and utilizes a resistor to limit amperage requirements. Drain pan shall not be part evaporator cover, but shall be part of the evaporator module with drain valleys to insure proper drains of the condensation. The return air filter is located at the coil and is easily accessible for maintenance without removal of the evaporator cover. The evaporator coil is copper tube design with aluminum fins. Evaporator assembly shall be a galvanized design. The evaporator shall utilize an orifice tube in lieu of a thermal expansion valve for a more trouble free operation. The evaporator cover have no sharp edges and must meet FMVSS 302 specification standards. High Pressure and Low Pressure (switch) protection are part of the evaporator assembly to maximize compressor and entire system protection. Evaporator air outlet louvers shall be adjustable to provide maximum directional airflow throughout the vehicle.

Driver's area in-dash evaporator: The OE Chassis supplied drivers in-dash evaporator shall be utilized and is tied into to passenger area air conditioning system.

Condensers: One (1) Model 25060 skirt mounted condenser rated @ 100,000 BTU/hr. The condensers shall have two (2) 14" high performance fan/motor assemblies with extended brush life motors. The coil shall be a parallel flow design for lighter weight and maximum heat rejection efficiency. Each condenser assembly shall be designed to distribute air away from the vehicle floor. The condenser is installed in such a manner to assure the entire coil face area is exposed to fresh air from the outside of the vehicle skirt (the skirt of the vehicle will not in any way interfere with direct airflow through the coil). The system design shall use an accumulator with filter desiccant in lieu of a filter drier. The accumulator shall be mounted at the lowest point of the system (on the chassis frame rail) for maximum system protection. In addition, the accumulator shall include an oil pickup tube to insure proper compressor lubrication upon startup of the a/c system. The electrical connections shall be corrosion resistant

This air conditioning system utilizes environmentally friendly R-134A. Refrigerant hoses are ATCO, Air-O-Crimp 3800 Barrier hose with one-piece stainless steel clamps, all designed to meet SAE-J2064.

The thermostat controls shall be located in an area easily accessible to the driver. All wiring is color coded. The entire electrical system shall utilize a simplified relay board with ground leg switching. The relay board shall consist of LED's to aid in the diagnosis of electrical continuity. Each circuit shall be protected by individual fuses for greater protection of the relay board components. The system shall be protected with manual reset circuit breakers.

*Details of System Capacities:

Model	Compressor	System Capacity	OE Dash Capacity	Total Bus a/c Capacity
R476021	TM-21	75,000 BTU/hr	15,000 BTU/hr *	90,000 BTU/hr*
			20,000 BTU/hr**	94,000 BTU/hr**

* Ford E Series/Chevy G Series OE Chassis Rating
** Ford F Series/Freightliner/IC OE Chassis Rating

ACC Climate Control; *A Spheros Compnay*
22150 Challenger Dr.
Elkhart, Indiana 46514
Phone: 574.264.2190 Toll Free: 800.462.6322
Fax: 574.266.6744
www.accclimatecontrol.com

SPHEROS

ACC Climate Control

2 Year Unlimited/3 Year 75,000 Mile Warranty

ACC Climate Control, hereinafter referred to as "ACC", warrants its products to the original purchaser, subject to normal use and service, for a period of 24 months w/unlimited mileage or 36 months 75000 miles and while in possession of the original owner.

ACC agrees to repair or replace with a new or repaired part, any part of an ACC unit which, after inspection has proven to fail because of a manufacturing defect, within the warranty period. Replacement of a defective part within the warranty period will include labor for replacement at factory established rates if performed at any authorized Service Center. Compensation at factory established rates for loss of refrigerant will be paid only when caused by a defective part and if the defective part itself was under warranty at the time of failure.

CONDITIONS OF WARRANTY

1. **Handling of Warranty Claims**.
   - A. Should a failure occur to an ACC component under warranty, call ACC at (574) 264-2190 for authorization (**pre-authorization is required before work is performed**) and return the vehicle to the installer or dealer from whom the air conditioning was purchased. Present your copy of the warranty registration card. He will make the necessary repairs to the system or replacement parts as covered by the warranty.
   - B. If it is not possible to return to the original dealer, take the vehicle to any convenient ACC dealer and present your Warranty Card. He will contact the factory for authorization for the necessary repairs. Should you be unable to locate an authorized ACC dealer, contact the factory and you will be assisted.

2. **EXCLUSIONS FROM WARRANTY**

   THIS WARRANTY SHALL NOT APPLY TO:
   - A. Any part or parts of products becoming defective as a result of negligence, accident, or other casualty.
   - B. Owner's failure to provide normal maintenance such as lubrication of engine, tightening belts, cleaning coils, loss of refrigerant, drier replacement or improper voltage or electrical connections.
   - C. Improper installation, repair, or alterations.
   - D. Operation in a manner contrary to ACC's printed instructions.
   - E. Any parts or products which have been repaired or altered outside of ACC's factory unless specific written authorization for such repair or alteration has been issued by ACC.

2. **Conditions**.
   - A. ACC neither assumes nor authorizes any person to assume for it, any obligations or warranty other than stated herein.
   - B. ACC reserved the right to make changes in design or improvements of its products or parts thereof without obligations to make or install such changes or improvements in or upon products covered in this warranty.
   - C. Remedies available to the owner for breach of the A/C Factory Warranty are expressly limited to an action to recover the cost of repairs or replacement due hereunder.
   - D. Repair or replacement of any part or parts of the products under this Warranty shall not extend this Warranty with respect to such repaired or replaced part or parts beyond the warranty period.
   - E. ACC does not warrant the workmanship of the installer and will not bear any cost due to faulty or incorrect installation or shipping damage.
   - F. ACC will not be liable for loss of time, labor, equipment, rental, or other expenses while products are out of service.
   - G. ACC shall credit authorized dealers for labor for replacement or repair of defective parts discovered during the warranty period according to the published schedule of labor allowance in the Warranty Policy and Procedures Manual.
   - H. This Warranty shall remain in effect during the warranty period when the equipment is properly installed, serviced and operated under normal conditions according to ACC's instructions.
   - I. Items such as filters, belts, driers, lubricants, motor brushes, etc. are considered expendable and not covered under warranty.

ACC DISCLAIMS ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF USE OF THE VEHICLE, LOSS OF TIME, INCONVENIENCE; EXPENSE FOR TRAVEL, LODGING, LOST INCOME OR REVENUE, TRANSPORTATION CHARGES OR LOSS OR DAMAGE OF PERSONAL PROPERTY.

SOME STATES DO NOT ALLOW EXCLUSIONS OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSIONS MAY NOT APPLY TO YOU.

THIS WARRANTY IS THE ONLY EXPRESSED WARRANTY BY ACC AND NO DEALER OR SERVICE FACILITY IS AUTHORIZED BY ACC TO MODIFY OR EXTEND IT. ANY IMPLIED WARRANTIES, INCLUDING WARRANTY OF FITNESS FOR PARTICULAR PURPOSE, OR WARRANTY OF MERCHANTABILITY, ARE EXPRESSLY LIMITED IN DURATION TO THE SAME PERIOD AS THE EXPRESSED WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

THIS WARRANTY IS NULL AND VOID UNLESS THE WARRANTY REGISTRATION CARD IS COMPLETED AND MAILED TO ACC WITHIN THIRTY DAYS OF THE DATE OF ORIGINAL RETAIL PURCHASE.

IN ADDITION TO THE ABOVE RIGHTS, THE PURCHASER HAS CERTAIN LEGAL REMEDIES PROVIDED BY THE MAGNUSON MOSS WARRANTY ACT, PUBLIC LAW 93-637. YOU MAY ALSO HAVE CERTAIN RIGHTS UNDER STATE LAW.

ACC Climate Control · 22428 Elkhart E. Blvd · Elkhart, IN 46514 · PH 800-462-6322

Updated 03/10/08

TARABUS NT Specification Sheet

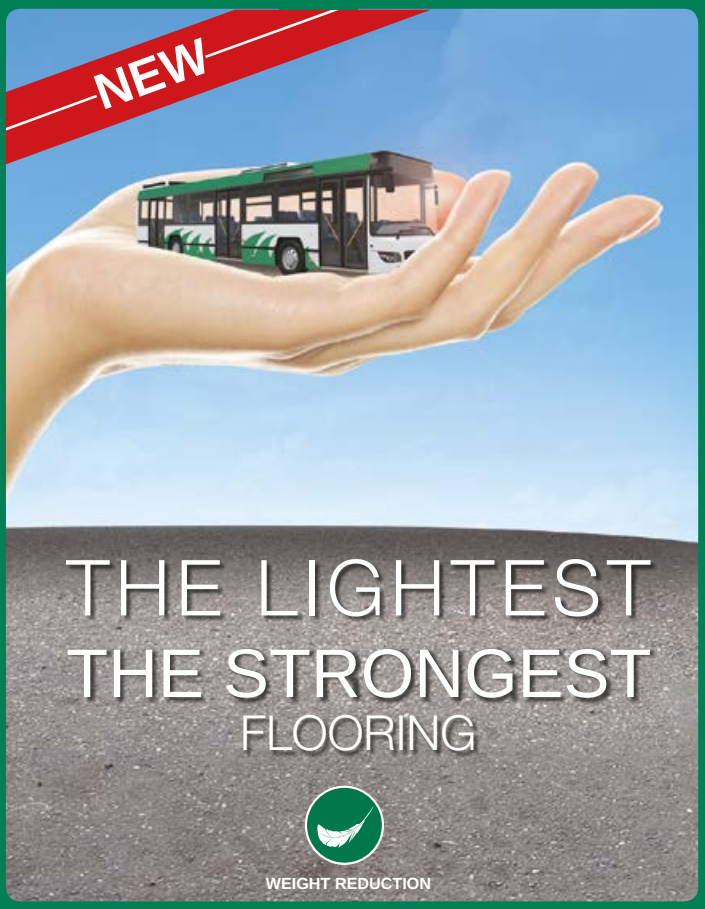
Product description and composition:
• The flooring shall be specially designed for buses.
• The flooring shall be flexible PVC flooring in 2.25 mm thickness, composed of a compact plasticized wear layer.
• The wear layer shall contain inlaid silicon carbide particles to improve slip resistance.
• The wear layer shall not contain aluminium oxide particles or quartz granules to prevent from maintenance and cleaning issues.
• The wear layer shall not contain fillers (fillers<5phr).
• The design shall be inlaid through the whole thickness of the wear layer.
• The intermediate layer of the flooring shall be made of a glass fibre grid, providing outstanding dimensional stability: ≤ 0.2% according to EN 434.
• The flooring shall have a special textile backing designed for public transport vehicles, to enable bonding with acrylic glues onto plywood substrates or plywood with phenolic film substrates or aluminium.
• The flooring shall not crack and no white line shall appear when bended by 180 degrees.
• The welding rods shall be manufactured by the flooring manufacturer to enable a perfect weld.

Environment:
• The flooring shall be free from heavy metals (Lead, Cadmium, Barium, Tin, Chromium…).
• The flooring shall be free from DEHP plasticizer.
• The manufacturer of the floor covering must be in possession of a valid ISO 14001 certificate.

Technical characteristics:
• Fire class: the flooring material shall conform to the European Directive 95/28/EC
• Fire class: the flooring material shall conform to the FMVSS/CMVSS 302
• Fire class: the flooring shall have been tested to UTAC ST 18502/1 (Type A) and ISO 3795/76 (0mm/mn)
• Fire class: the flooring shall obtain CRF>0.50 W/cm2 when tested according to NFPA 253 – ASTM E648
• The manufacturer of the floor covering must be in possession of a valid quality systems certificate, showing compliance with ISO 9001.

Installation:
• All joints must be welded using a hot welding gun and PVC welding rods. To ensure the right watertightness of the flooring system, no sealant shall be used between 2 flooring sheets.

GERFLOR Transport Flooring - June 2009



WORLD LEADER SINCE 1957 TARABUS BUS & COACH FLOOR COVERINGS

TARABUS

BUS & COACH FLOOR COVERINGS

Gerflor®
theflooringgroup

GAYA WOOD Noma

NT

8297 Yosemite

GAYA WOOD Walnut

GAYA WOOD Walnut

NT

6057 Everglades

MK

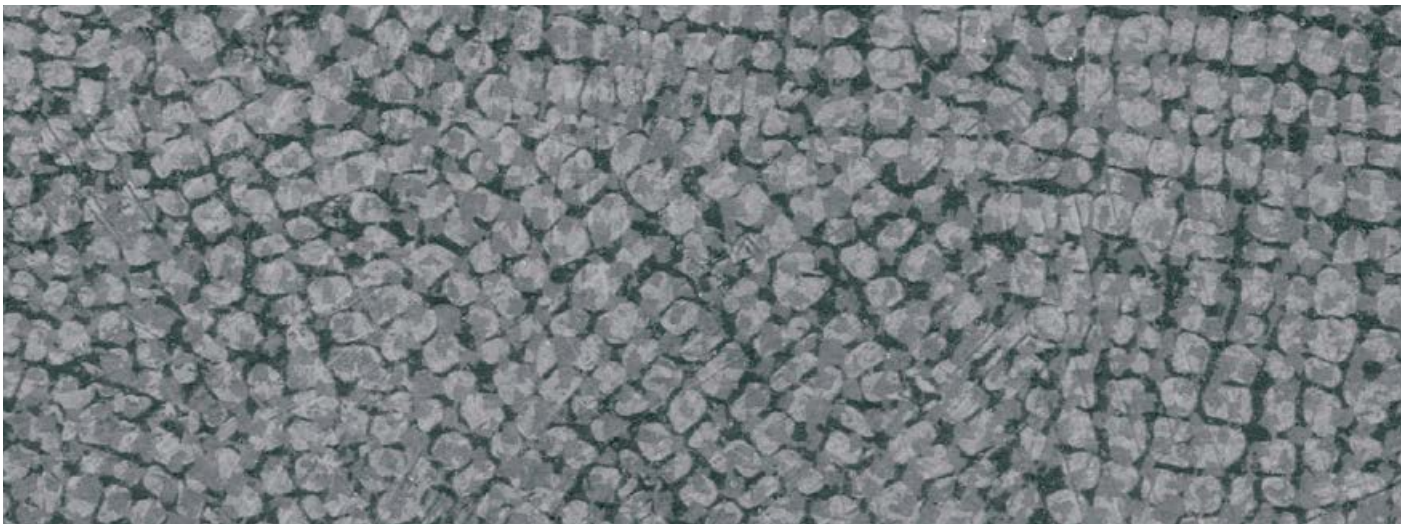
NT

4521 Yellowstone

NT

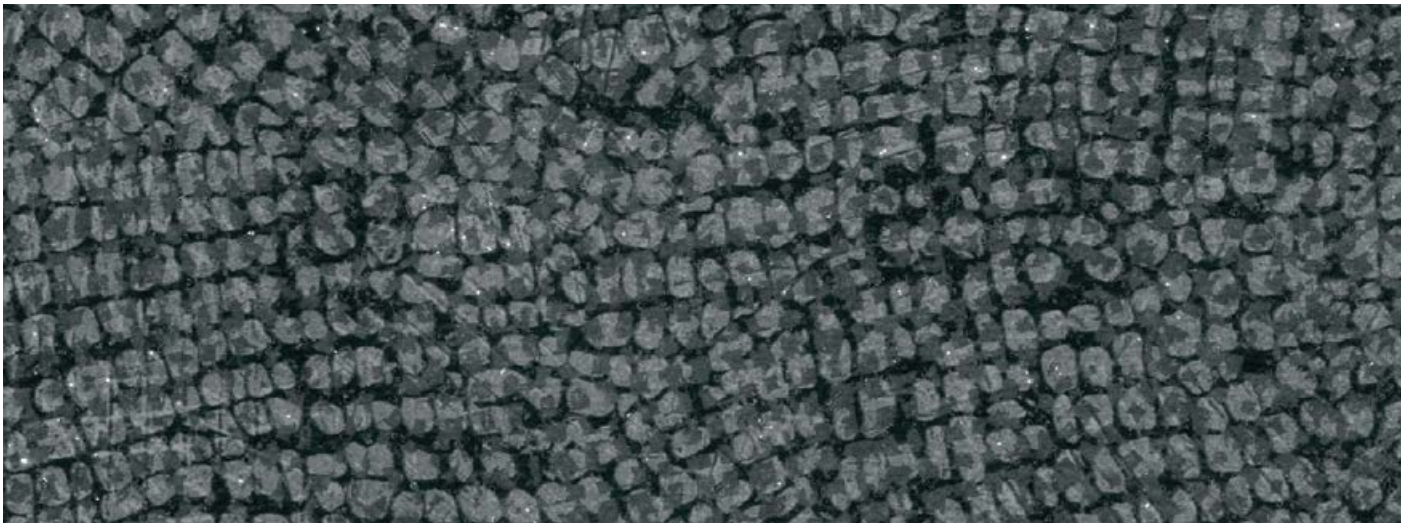
3724 Kruger

GAYA MOSAIC



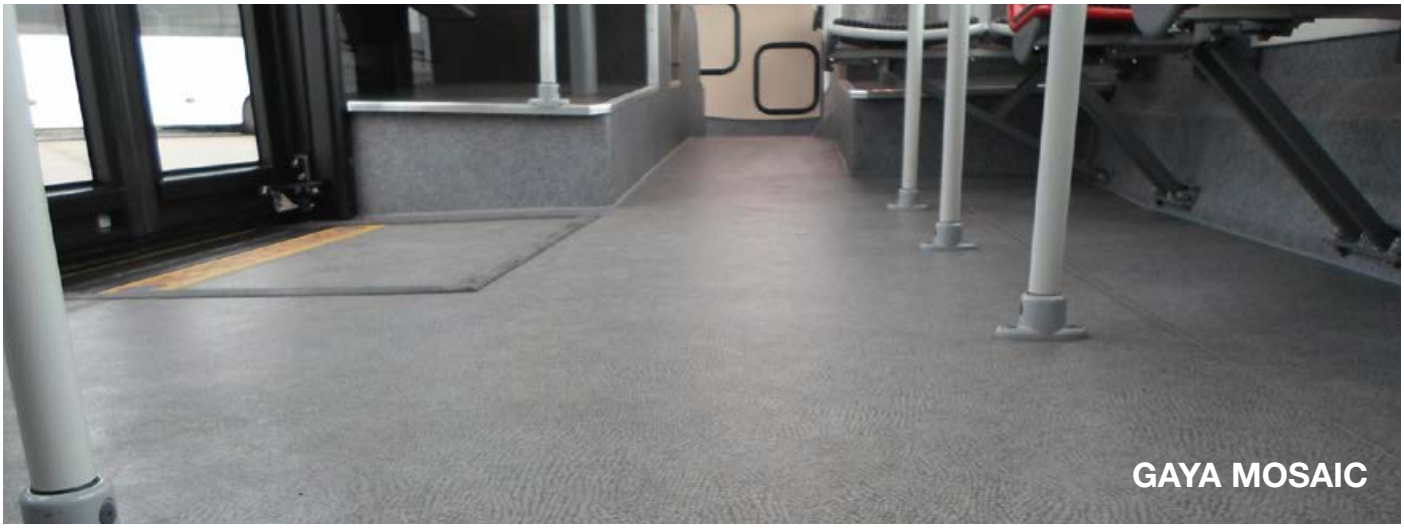
NT

4482 Babel



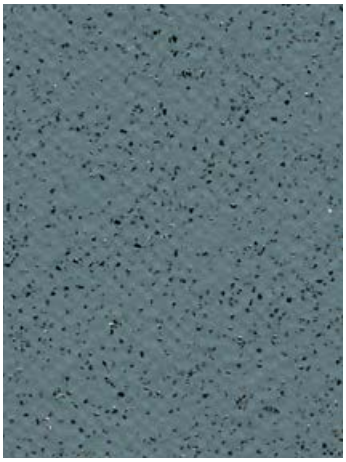
NT

4519 Galata

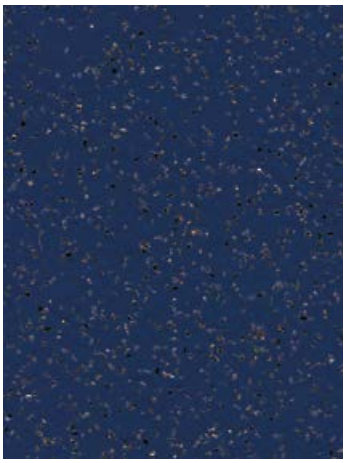


SIRIUS

6768 Griffon NT



6782 Dune NT



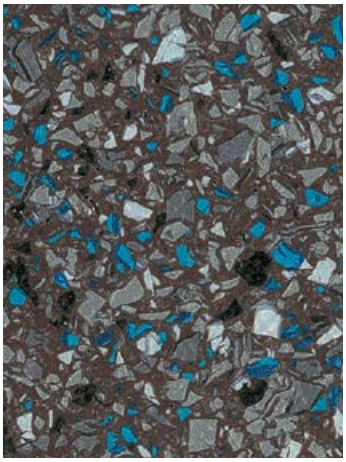
6451 Corsaire NT

6727 Anthracite NT

6801 Graphite NT

APOLLO

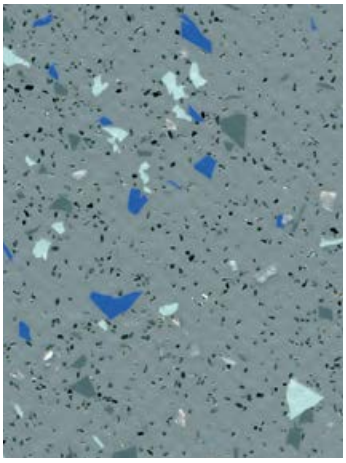
4776 Masan MK NT



4479 Kilimanjaro MK NT

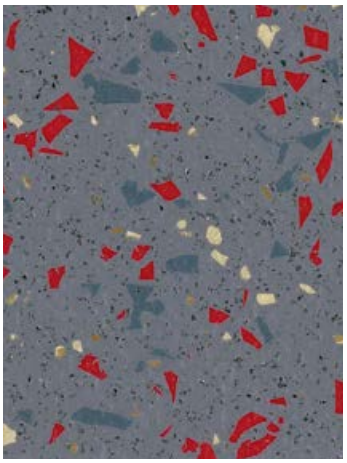
4517 Fuji MK NT

HELIOS



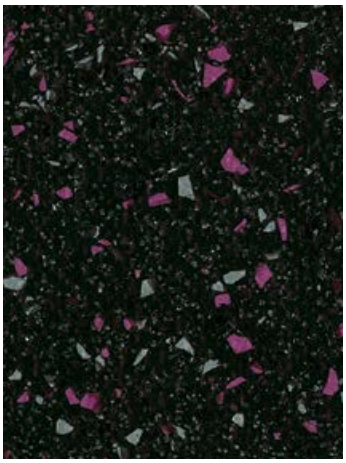
MK NT

8804 Selenium



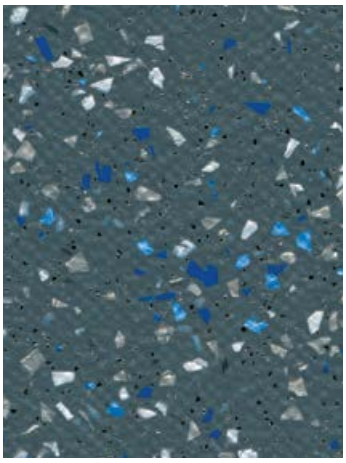
NT

4483 Dubnium



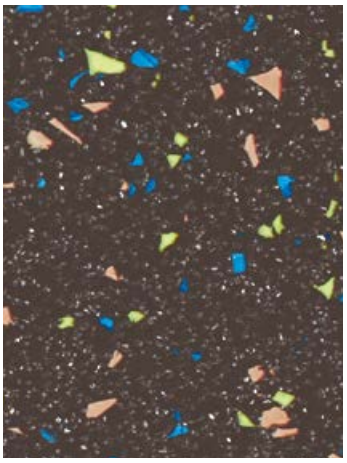
MK NT

3740 Indium



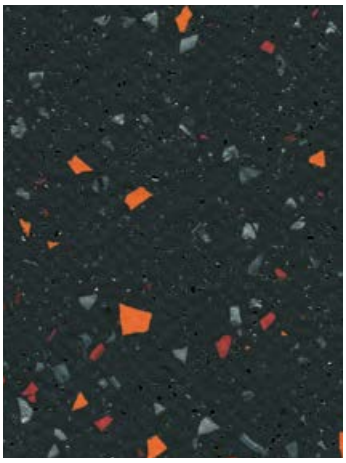
MK NT

8805 Palladium



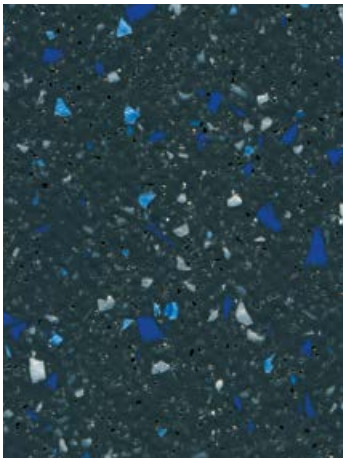
MK NT

8031 Samarium



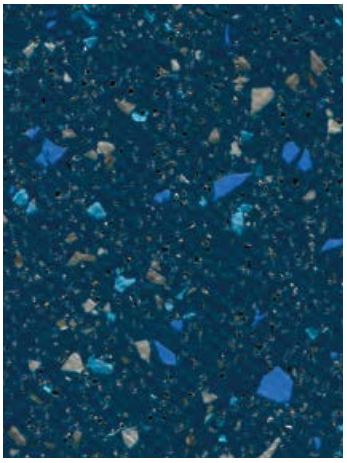
MK NT

8803 Gallium



MK NT

8806 Rhodium



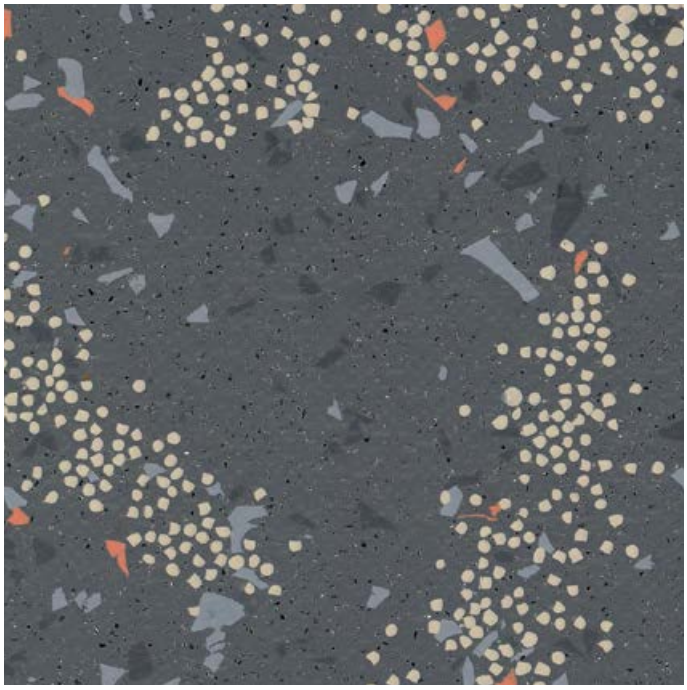
NT

8486 Vanadium

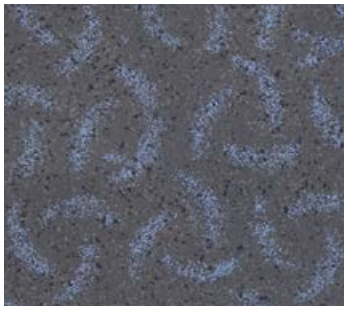
MK Foam backing

NT Textile backing

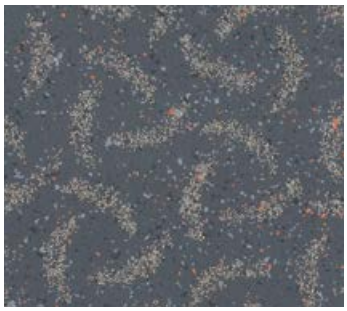
LUNA



8816 Singapore NT

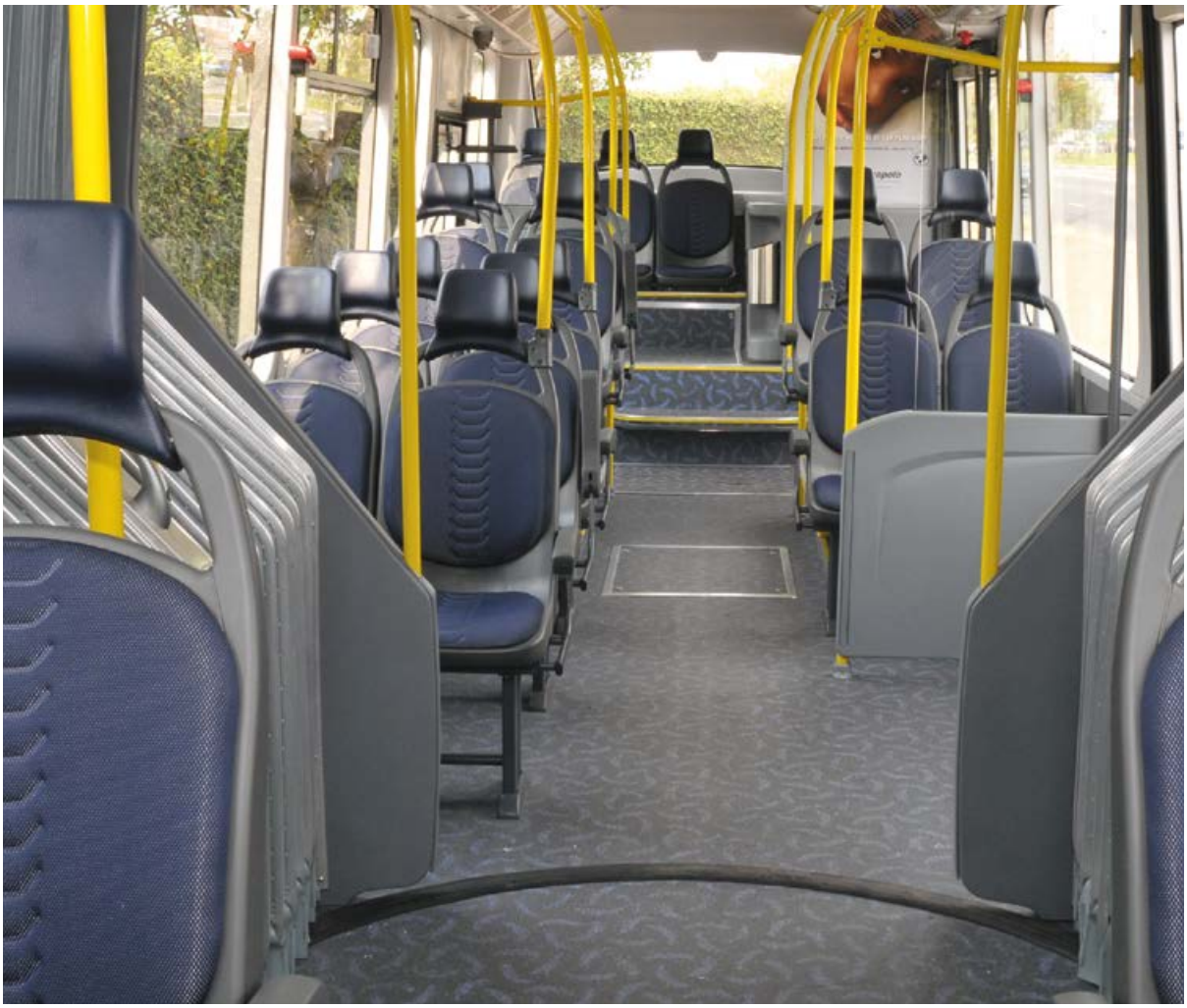


8729 Norway* NT



8816 Singapore* NT

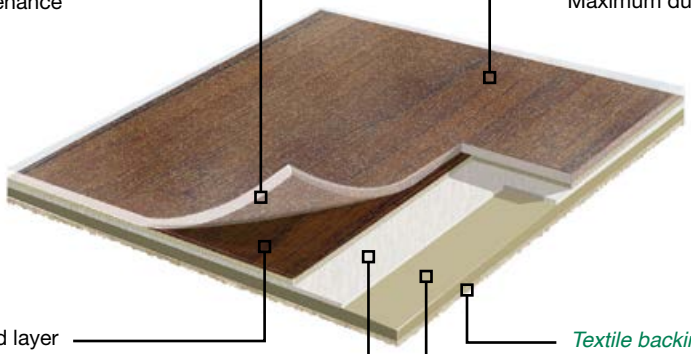
**Scale reduction*



Product Construction

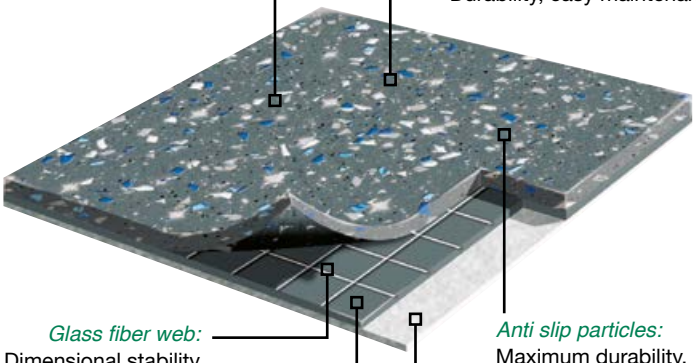
Tarabus Gaya

NT



Tarabus standard

NT



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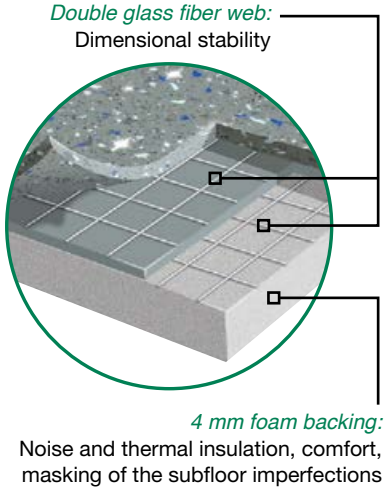
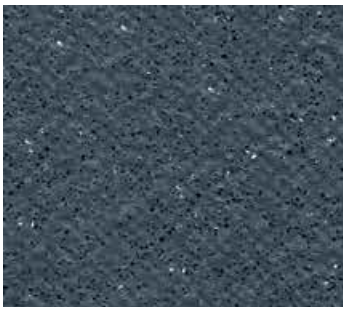


Safebus X'tra



NT

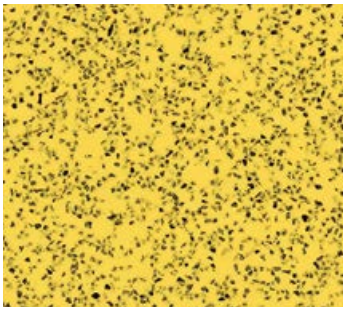
6822 Dark Grey

Venus

NT

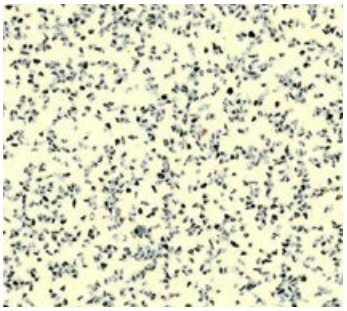
6727 Anthracite

Safebus



NT

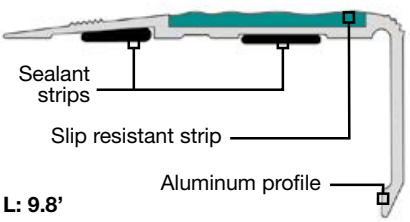
6602 Caledonia



MK NT

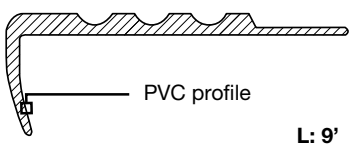
6203 Borneo

Stepbus



L: 9.8'

Step nosing



L: 9'

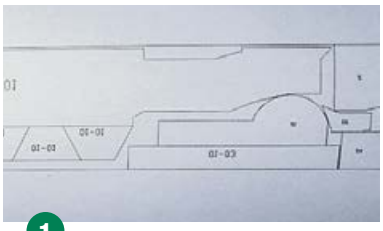
Yellow

White

Installation

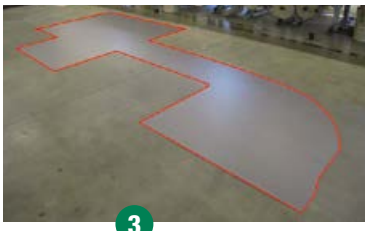
KIT System

Pre-cut and pre-welded **TARABUS** floor covering system according to your drawings



1 Send us your floor plan layout

2 We cut with high precision



3 ...and pre-weld if required

TARABUS Self-Adhesive

TARABUS floor covering with self-adhesive backing

> Environmental friendly bonding
> Ready to bond
> No curing time
> Safer work conditions
> Easy to use

TIME SAVING

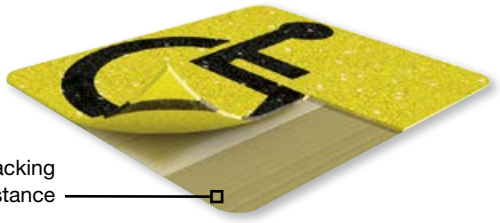
Customization

TARABUS LOGO

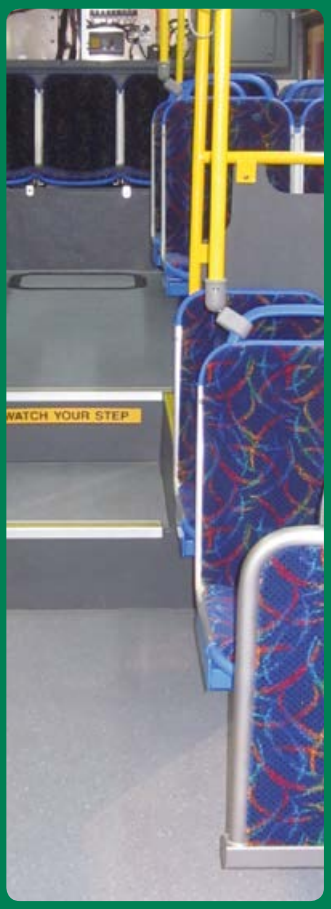
- Location for person with reduced mobility

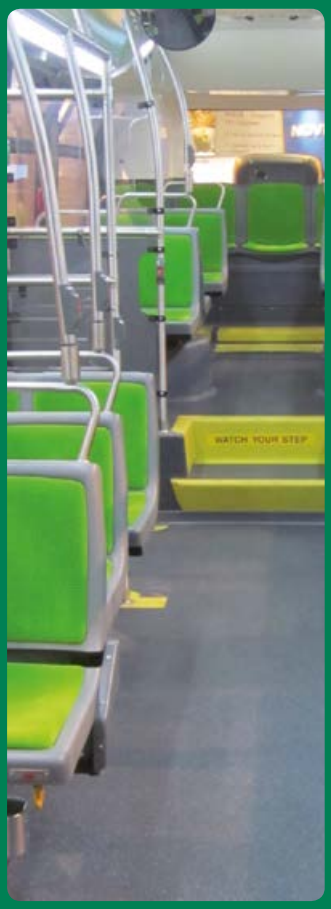
- Advertising & Promotion

Almost unlimited possibilities of water-resistant logos



Laminate backing for water resistance





AFAQ ISO 9001

AFAQ ISO 14001

PN: X3059997 - 03/2016

TARABUS *Be* **CONNECTED!**

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us.tarabusbygerflor.com

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595 Supreme Dr
Bensenville 60106 IL USA
Tel: 877 GERFLOR (437 3567)
Fax: 847 394 3753
tarabus@gerflor.com
tarabusbygerflor.com

Gerflor® theflooringgroup

Warranty Registration

TO REGISTER YOUR PRODUCT WARRANTY under the terms of Gerflor's North America Limited Product Warranty, please complete the form below and mail to:

Gerflor USA Inc
595 Supreme Dr
Bensenville 60106 IL USA.

I acknowledge having received and read GERFLOR's technical documents and specifications concerning the product warranty:

Product Type: _____

Roll numbers & Quantity (sq.yds/m²): _____

Installation Date: _____

Transit Authority: _____

Address: _____

State/Prov: _____ Zip/Postal Code: _____

OEM: _____

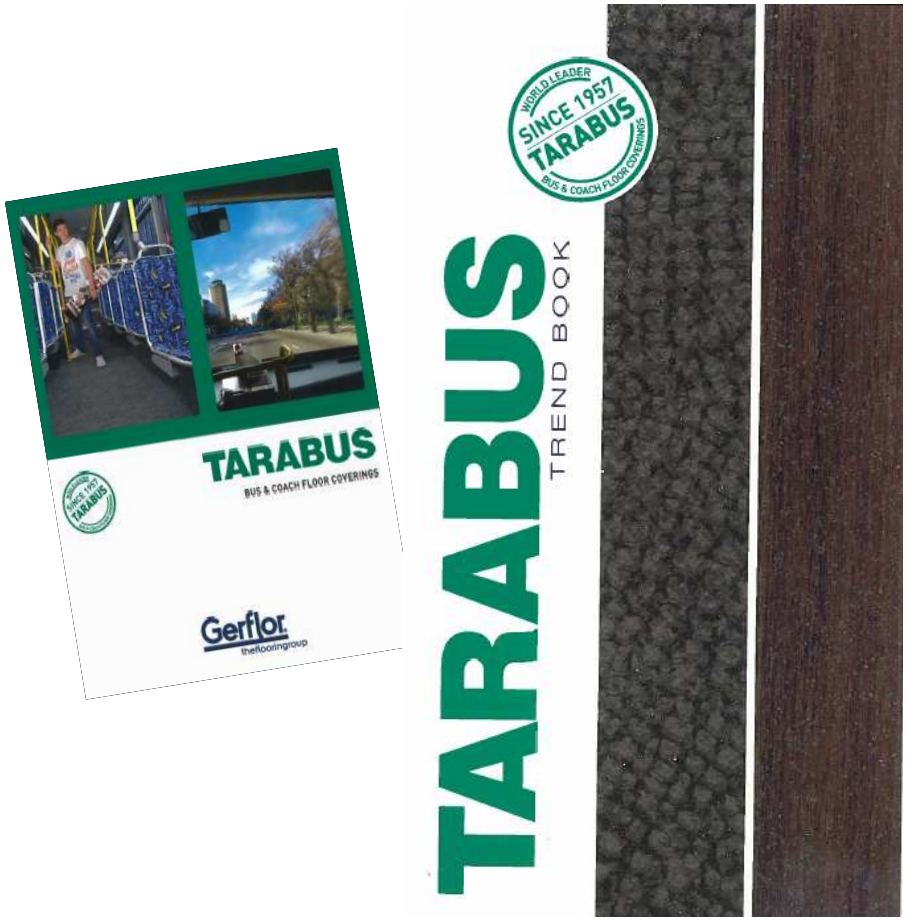
Address: _____

State/Prov: _____ Zip/Postal Code: _____

Represented by: _____

Signature:

TARABUS
PRODUCT WARRANTY



TARABUS FLOORCOVERINGS LIMITED WARRANTY AGREEMENT

Warranty Terms and Conditions

GERFLOR, as a manufacturer, expressly warrants that TARABUS floorcoverings for buses and coaches are conform to the technical data sheet in force at the time of delivery.

GERFLOR further expressly warrants that the wear layer of TARABUS floorcoverings shall be free from defects in material for **12 years (twelve years)** from the date of sale, provided such floorcoverings are exclusively subject to normal use and service, and are installed and maintained in accordance exactly with GERFLOR's recommendations that the buyer declares to be aware of.

The wear layer consists of the material above the glass fiber web in the floorcovering. GERFLOR expressly warrants that the glass fiber web will not appear in the floorcovering for **12 years (twelve years)** from the date of sale.

This entire warranty will become null and void if conditions of the subflooring and method of installation do not conform exactly to GERFLOR's specifications.

This entire warranty does not cover damage caused, in whole or in part, by conditions beyond the control of GERFLOR, including but not limited to:

- Use for which material is not designated.
- Fire, explosion, or natural disasters.
- Faulty installation
- Casualties
- Ordinary wear and tear
- Abuse
- Faulty design or construction of the vehicles.
- Failure of the adhesive to adhere to the subfloor because of presence of moisture.
- Fault in the subfloor.
- Failure of the welding
- Uneven wear of sections of the floorcovering.
- Alteration of the initial appearance of the floorcovering, particularly in high traffic areas exposed to extreme heavy wear.
- Damage caused by negligent or improper maintenance procedures and other causes not specified but beyond the control of GERFLOR.
- Fading or discoloration from sunlight or heat.
- Mechanical damages. burns, chemical soiling or damage due to clamp or inadequate cleaning, not recommended by GERFLOR.

The presence of moisture between the TARABUS and the subfloor shall be considered proof of subfloor failure or faulty design or construction.

This warranty will be applied only if the product is admitted to be the only cause of disorder.

The sole and exclusive remedy against GERFLOR arising from the purchase or use of TARABUS is limited to supply of material in replacement of the sole defective part of material (after examination. verification and approval by GERFLOR) with material of equivalent quality –(colour shade between brand new material and existing one will be accepted by the owner)-. All other compensation of whatever nature will be excluded.

If the claim is accepted by GERFLOR, with respect to the warranty of the wear layer, for the first 2 (two) years from the date of sale, GERFLOR will supply the material, in replacement of defective one, free of charge. More than 2 (two) years from the date of sale, until the expiration of this express warranty of the wear layer, a depreciation of 7% (seven per cent) per year of the cost of supplied material will apply.

WARRANTY AND LIABILITY LIMITS

THE ABOVE EXPRESSED MANUFACTURER's WARRANTY SHALL BE THE EXCLUSIVE WARRANTY AND LIMITED TO THE QUALITY OF THE PRODUCT, AND GERFLOR MAKES NO OTHER WARRANTIES. GERFLOR EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANBILITY AND IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

IT IS AGREED THAT GERFLOR SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, including but not limited to, loss of income, loss of use, damage to other property, the cost of removing and reinstalling TARABUS floorcoverings, attorney's fees, and any liability you may have with respect to any other person.

TIME LIMIT FOR PLACING A CLAIM

To be admissible, all claims by means of this warranty contract must be carried out by **registered letter with return receipt** addressed to GERFLOR, at the address indicated at the top of this warranty contract, **accompanied by the purchase invoice** for the Product, within THIRTY DAYS following finding of irregularities and within the aforementioned warranty contract time limit. If any clauses of this Warranty Agreement conflicted with the law or a given jurisdiction, only said clause would be considered inapplicable, the remaining text of the Agreement remaining unaffected.

This Limited Warranty shall be governed and construed in accordance with the laws of the State of Illinois without regard to any choice of low principles: All disputes that may arise between You and GERFLOR relating in any way to this Limited Warranty Agreement, to the extent such disputes cannot be resolved by negotiation between You and GERFLOR, shall be decided by arbitration carried out in accordance with the Federal Arbitration Act and the Commercial Arbitration Rules of the American Arbitration Association. In the event of such a dispute, arbitration may be initiated by a request for arbitration by either party hereto addressed to the other party, and shall be completed within sixty (60) days of such request unless extended because of unavailability of an arbitrator or other events beyond the control either party. The arbitrator shall be chosen by mutual agreement of the parties and, in the event the parties cannot so agree, either party may file a written application to have the arbitrator designated by the American Arbitration Association. The arbitration proceeding shall take place in Chicago, Illinois or such other location as the parties shall agree and shall be conducted in accordance with the Commercial Arbitration ‘’Expedited’’ Rules of the American Arbitration Association. The arbitrator shall have all powers necessary to determine the issues presented, including without limitation, but subject to the terms of this Limited Warranty, any damages. The decision of the arbitrator shall be final and conclusive, both as to costs and the merits, and the parties agree that they shall be bound by this decision.

FEATHER WEIGHT

FOLDAWAY BV & AM STYLES

Freedman Seating gives you the largest selection of Foldaways in the industry. Whether you need space for luggage or wheel chairs, we have the right seat. Easy to install and easier to operate, our Foldaways will provide you with miles and miles of happy riders and drivers. Maybe we should say, “smiles and smiles”. Freedman Seating, “Not just seats—seating solutions.”

Notch-Back, standard Bench-Back and High-Back are shown.

Not Just Seats

Seating Solutions™

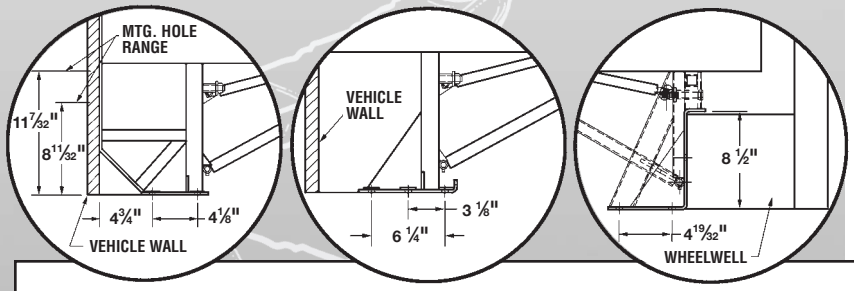
THE FEATHER WEIGHT SERIES BY

FREEDMAN SEATING COMPANY

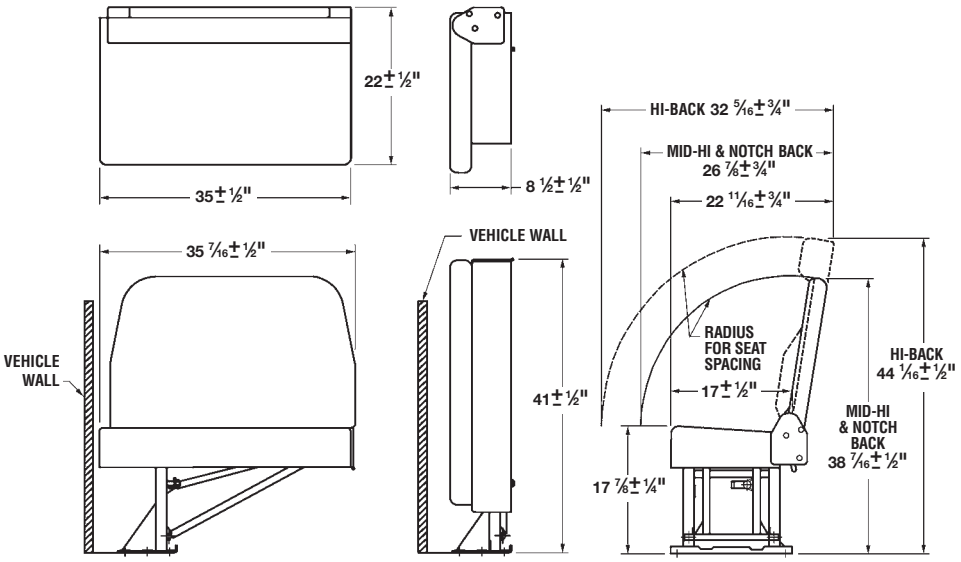
an ISO 9001:2000 certified company

FEATHER WEIGHT

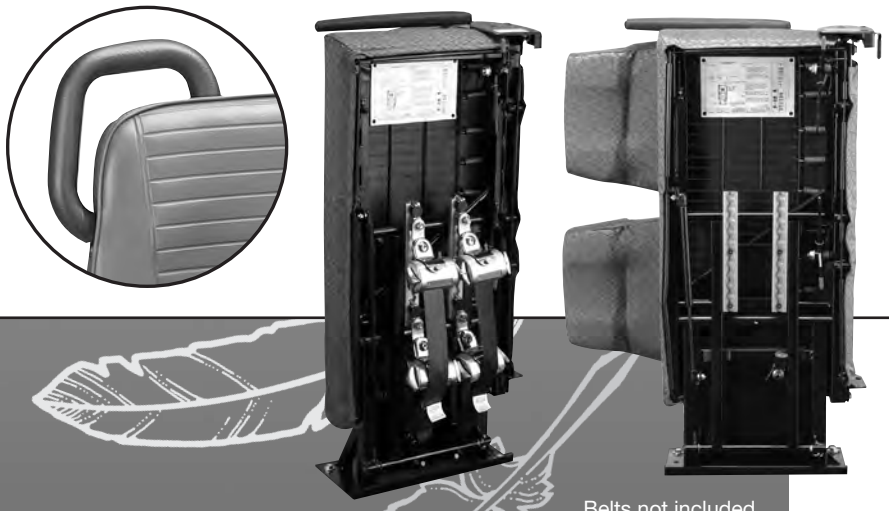
Foldaway BV & AM STYLES



AM2 Floor/Wall Mount | BV Floor Mount | BVWW3 Floor Mount



Corner Grabs | TDSS with belts | TDSS without belts



Belts not included.

Standard Features:

- BV Foldaways mount to the vehicle with four bolts to the floor (no wall mount)
- AM Foldaways mount to the vehicle with four bolts to the floor and two to the wall mount
- Seat belt ready (FMVSS 210 compliant with no leg or tether)
- Ultra-thin backrest for added hip-to-knee room and lumbar support
- High quality molded polyurethane seat and back cushions
- Folds up to less than 10" thick when in the stowed position
- Cantilever design provides reduced installation time; no floor cutting for aisle leg and easy vehicle clean up
- Wire mesh grid seat springs for even support
- 2 locking mechanisms to hold seat in stowed position

Options:

- Single or double seats
- Bench back, notch back or high back
- Wheel well seats
- Wide variety of vinyl's or cloths
- Molded U.S. arms or upholstered arms
- Black or yellow top grabs (not on high backs)
- Black or yellow corner grabs (black only on high back)
- Vertical stitching
- FTA foam
- ABS backs (Notchback only)
- Adjustable headrests (Single and Notchback only)
- Shrouds to cover the Foldaway when stowed
- USR seat belts (Under Seat Retractors)
- CRS-225 hooks and tethers
- TDSS (Tie Down Storage System)

Not Just Seats™

Seating Solutions™

THE FEATHER WEIGHT SERIES BY

FREEDMAN SEATING COMPANY

an ISO 9001:2000 certified company

4545 W. Augusta Blvd., Chicago, IL 60651
(773)524-2440 (800)443-4540 Fax: (773)252-7450
WWW.FREEDMANSEATING.COM
e-mail: sales@freedmanseat.com

We are constantly updating and improving our seats; therefore we reserve the right to change or modify specifications or materials without notice. All Freedman Seating Company seats meet or exceed FMVS standards.

FEATHER WEIGHT

MID-HI SEAT "ROCK SOLID"

Sustainable Seating Solutions

Freedman Seating Company's Feather Weight seats are designed to be like feathers on a bird: light and airy to satisfy weight restrictions and ensure a smooth ride, yet durable for years of service and low maintenance.

Freedman Seating Feather Weight seats are the most severely tested in the company's history, and meet all applicable federal motor vehicle safety standards for strength andsafety (including 210 for seat belts). Less weight means one thing to bus builders and operators: they can get more passengers per bus.

And when we say more passengers, ***we mean more happy passengers.***

Not Just Seats

Seating Solutions™

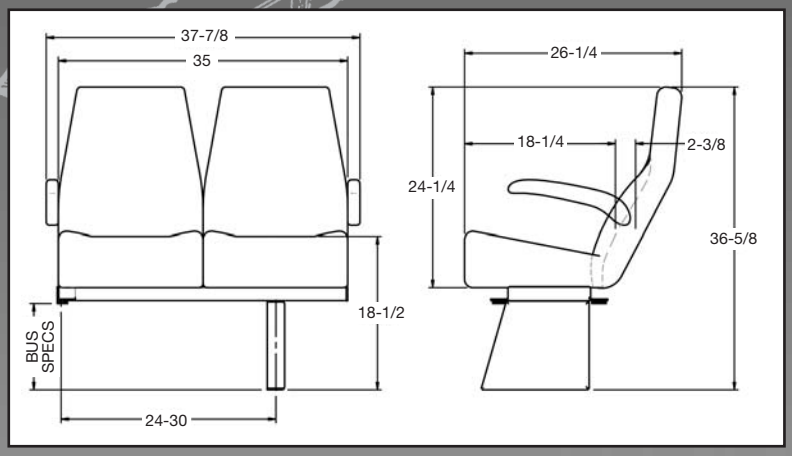
THE FEATHER WEIGHT SERIES BY

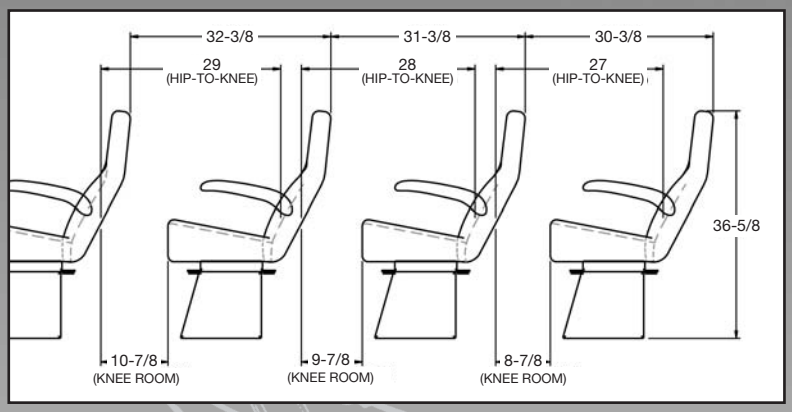
FREEDMAN
SEATING COMPANY

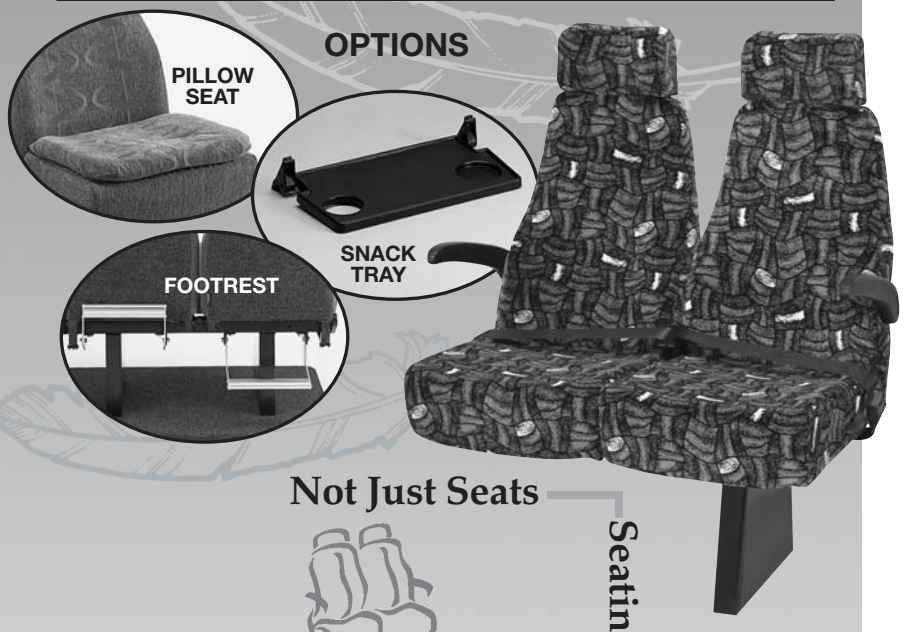
an ISO 9001:2000 certified company

FEATHER WEIGHT

MID-HI SEAT "ROCK SOLID"







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FREEDMAN SEATING COMPANY

an ISO 9001:2000 certified company

4545 W. Augusta Blvd., Chicago, IL 60651
(773)524-2440 (800)443-4540 Fax (773)252-7450
e-mail: sales@freedmanseat.com
WWW.FREEDMANSEATING.COM

Sustainable Seating Solutions

Whether your bus is for tour/charter, para-transit, or shuttle, Feather Weight Mid-Hi works for you. Optional adjustable headrests and reclining back-rests give you luxuries for long journeys, while grab rails and ABS plastic backs provide the function and safety required for shorter trips. The ultra-thin backrest gives outstanding support and creates more hip-to-knee room than any other seat in its class. The steel frame system meets or exceeds all applicable government standards for safety and durability. And, it's light as a feather!

Feather Weight Mid-Hi features include:

- An ultra-thin *Knee-Saver* type backrest for added hip-to-knee room and lumbar support
- Molded polyurethane seat and back cushions for comfort and long lasting support
- 17½" wide seat cushions
- 22½" back height off the seat cushion, 37" off the floor
- Wire mesh-grid seat springs for even support
- FMVSS 210 compliance–all *Feather Weight* seats are seat belt ready
- Transit style–rigid backrests (starting weight without options–43 lbs.)
- Touring style–reclining backrests (starting weight without options–47 lbs.)
- Covers that can be removed and replaced easily and without the use of special tools

Feather Weight Mid-Hi options include:

- Black molded *U.S. Arms* or upholstered flip-up armrests
- Adjustable headrests
- Black or yellow corner AV grab rails
- Black or yellow top AV grab rails
- ABS plastic backs
- Mesh map pockets
- Vertical stitching
- FTA foam
- Snack trays
- Aluminum folding footrests
- Pillow seat cushions
- Rear row quick disconnect
- Side sliders
- 16", 18" or 19" wide seats available
- Rigid or reclining backrests
- Seat belts
  - Non-retracting seat belts
  - Retracting seat belts
  - USR (Under Seat Retractors)
- S3 Bio-Cushions (Made with vegetable oil)
- A wide variety of cloths and vinyls
- S3 cloths (Made with recycled yarn)

We are constantly updating and improving our seats; therefore we reserve the right to change or modify specifications or materials without notice. All Freedman Seating Company seats meet or exceed FMVS standards.

ISO 9001:2000 registered

Freedman Seating Company

HOME / PARTS / AV GRAB RAIL

AV GRAB RAIL

Black
Part # 36380

Yellow
Part # 36339

Screws (2 required)
Part # 99114

Back to All Parts

CONTACT US

Offices throughout North America.

Find Your Local Representative

REQUEST UPHOLSTERY SAMPLES or SIGN UP FOR OUR NEWSLETTER

AN ISO 9001-2015 REGISTERED COMPANY

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FREEDMAN SHIELD DRIVER SEATS

Shield
Rigid
Seat

NOW AVAILABLE

Sport Seat
Upgrade

LeMans Adjustable Arm

Shield
Recliner
Seat

Sustainable Seating Solutions
Freedman Seating Company

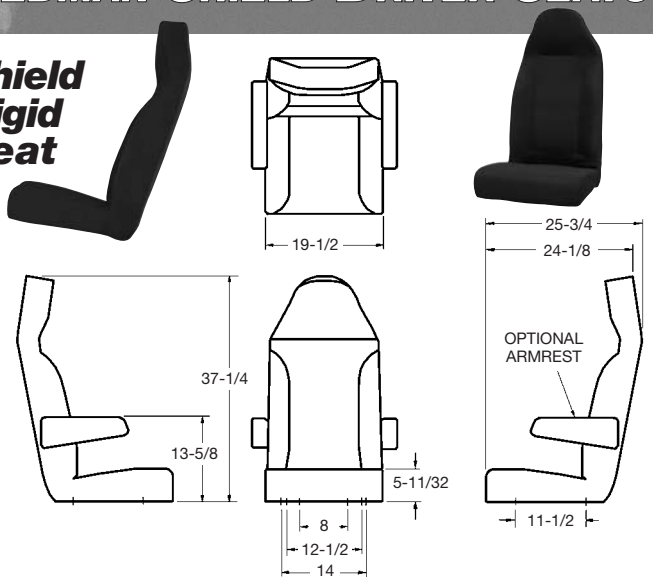
Not Just Seats

Seating Solutions™

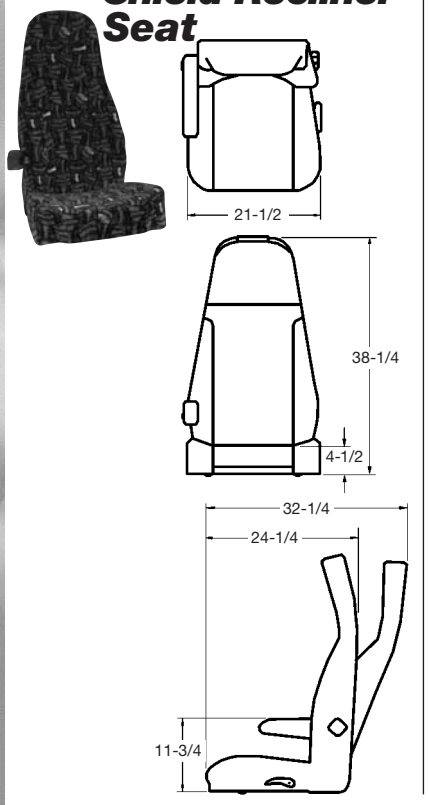
FREEDMAN
SEATING COMPANY

Freedman Shield Driver Seats

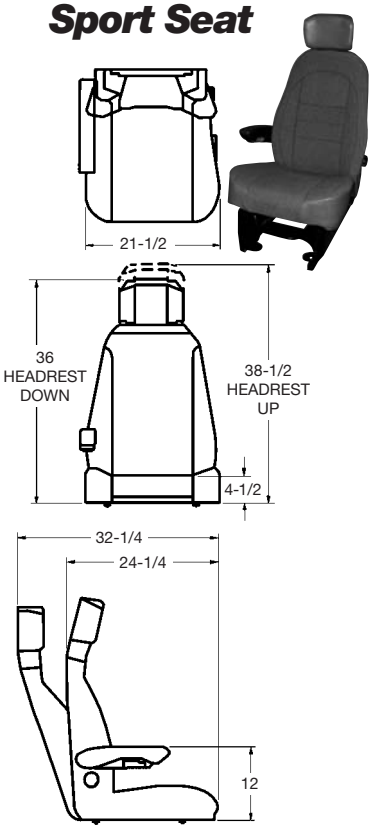
Shield Rigid Seat

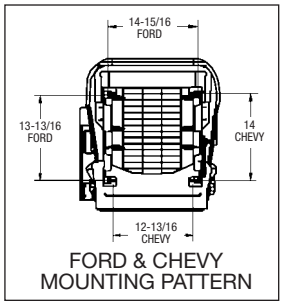


Shield Recliner Seat

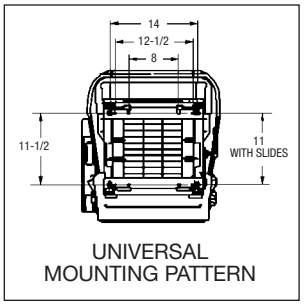


Sport Seat





FORD & CHEVY MOUNTING PATTERN



UNIVERSAL MOUNTING PATTERN

MARKETS

DELIVERY TRUCK | BUS | VAN | MARINE | SPECIALTY

We are constantly updating and improving our seats; therefore we reserve the right to change or modify specifications or materials without notice. All Freedman Seating Company seats meet or exceed FMVS standards.

Shield Rigid Seat

Standard features:

- Designed and tested to comply with all applicable FMVSS requirements including 202A headrest standard
  - Taller and wider headrest with decreased backset
  - "Cushier" headrest for dynamic impact headrest absorption
- Automotive grade 4-spring seat flex-o-later for even load support and long life
- J-clip upholstery fastening for quick change out with no special tools
- High quality molded polyurethane seat and back cushions
- Universal mounting holes to fit Freedman Seating pedestals and most aftermarket bases

Rigid Seat optional features:

- Flip arms: US Arm, AMA upholstered or wide upholstered
- Mesh map pocket
- Vertical stitching
- Wide array of fabrics and vinyls
- 4-position adjustable lumbar support
- S3 Bio Cushions
- Fore/Aft slide tracks

Shield Recliner and Sport Seats

Standard features:

- Designed and tested to comply with all applicable FMVSS requirements including 202A headrest standard
  - Taller and wider headrest with decreased backset
  - "Cushier" headrest for dynamic impact headrest absorption
- Mesh map pocket
- Automotive grade 4-spring seat flex-o-later for even load support and long life
- J-clip upholstery fastening for quick change out with no special tools
- High quality molded polyurethane seat and back cushions

Recliner Seat additional standard features:

- 4-position adjustable lumbar-LH lever (RH lever on copilot)
- RH Shield arm
- Heavy duty recliner mechanism
- Mounting brackets to fit Ford E-Series and Chevy cutaway seat delete bases

Recliner Seat optional features:

- Vertical stitching (not for Sport)
- Wide array of fabrics and vinyls
- FTA foam
- S3 Bio Cushions
- Universal mounting kit to fit Freedman Seating pedestals and aftermarket bases
- Fore/Aft slide tracks (not for Ford or Chevy seats), required for universal mounting

Sport Seat additional standard features:

- Infinitely adjustable **4-way** lumbar (up/down and in/out)
- RH LeMans arm

S3 Sustainable Seating Solutions
Freedman Seating Company

Not Just Seats

Seating Solutions™

FREEDMAN SEATING COMPANY

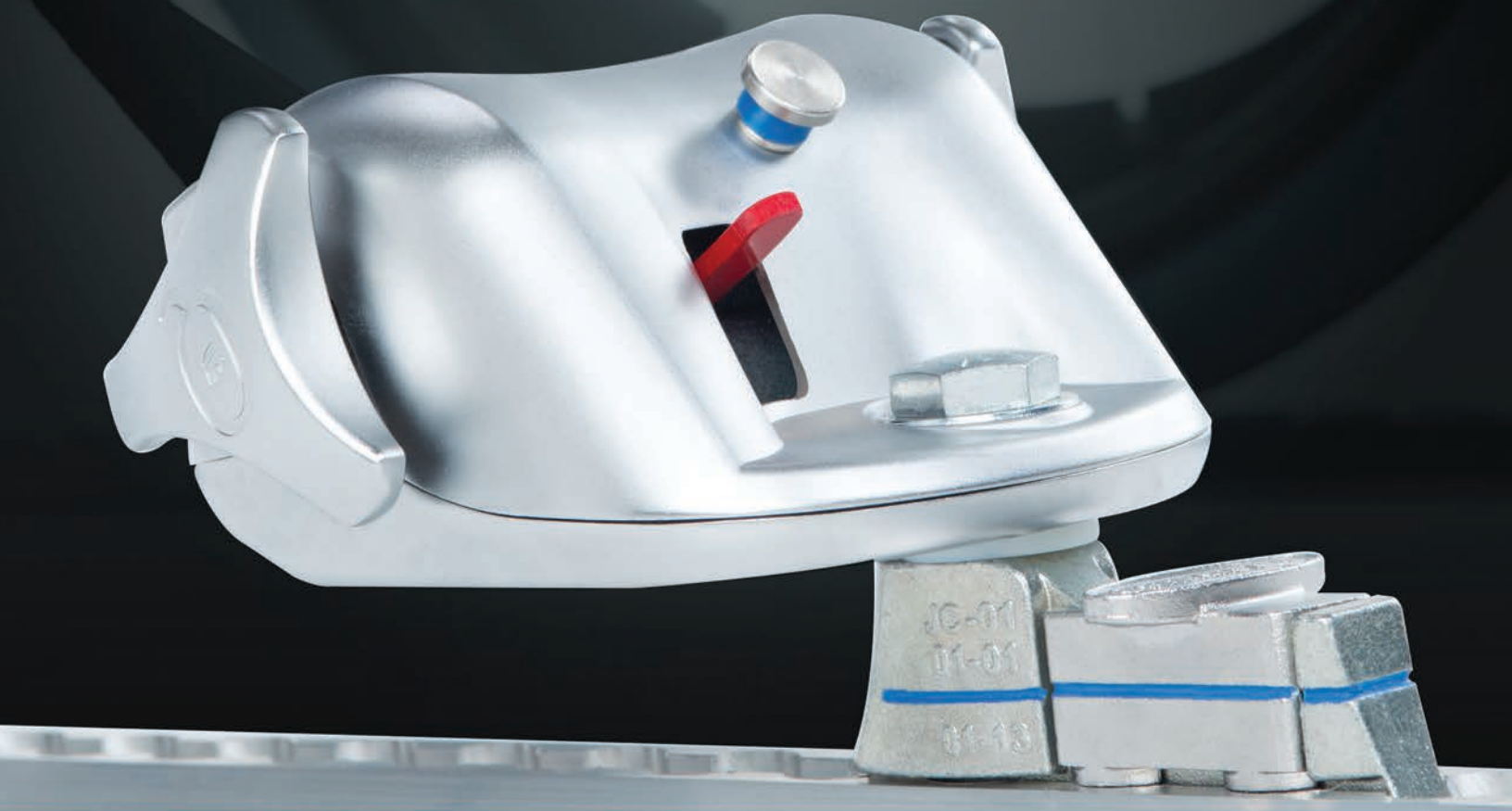
4545 W. Augusta Blvd., Chicago, IL 60651
(773)524-2440 (800)443-4540 Fax (773)252-7450
WWW.FREEDMANSEATING.COM
e-mail: sales@freedmanseat.com

Q'STRAINT®

Thinking ***Beyond*** Safety

QRT™ SERIES

The New Standard in Wheelchair Securement and Passenger Safety



QRT-3 SERIES

Meets the Requirements of **WC18**
Compatible with **WC19** Wheelchairs

QRT-360

MEETING TOMORROW'S STANDARDS, **TODAY**

Introducing the QRT-3 SERIES Wheelchair and Occupant Securement System:

The first 4-point, heavy duty, fully automatic retractable tie-downs designed, engineered and built to perform in wheelchair crash tests under **WC19** as well as withstand the higher loads of the **WC18 standard**.

More impressively, the new **QRT-360** meets these increased standards years ahead of their effective date in 2015.

WC18/WC19 at a Glance

As WC19 wheelchairs become increasingly popular, the countdown has already begun for wheelchair tie-downs to be compatible. Year-end 2015 will see the effective date of the revised RESNA WC18 standard for Wheelchair Tie-downs and Occupant Restraint Systems (WTORS).

The most significant implication of the revised standard is that wheelchair tie-downs must be stronger. WC19 covers the design and testing of wheelchairs for use in passenger transportation, and it brings about much needed passenger protection as well as some challenges for WTORS manufacturers.

These crash tested wheelchairs will feature lap belts that are integrally mounted onto the wheelchair frame, as opposed to relying on traditional WTORS equipment where the passenger belts are mounted separately. During a collision, this new dynamic produces higher loading on the WTORS as much as 60%. Enter the QRT-360, the first retractor to meet these new requirements.

AN ALL NEW DESIGN **FROM THE FLOOR UP**

Stronger than any previous retractors, the QRT-360 utilizes innovative energy management designs and material technologies to deliver the system's full strength for maximum load capacity.

An energy-absorbing steel frame, new high strength 58 mm webbing and fine-adjust self tensioning from 25 high-strength teeth, the QRT-360 retractors achieve a surrogate wheelchair rating that meets the requirements of WC18. The geometry of the teeth and an innovative new locking bar design provide perpendicular alignment for maximum strength. A re-engineered Positive Locking Interface contributes to the system's ability to secure extremely heavy loads.

With many more safety features than manual straps and significantly lighter and more practical than 6-point systems, space-efficient QRT-360 retractors safely secure both the chair and occupant in an easy-to-use 4-point restraint. This not only meets the new WC18 standard for combined occupant and chair securement, but it eliminates the need, cost and additional securement time associated with having four anchorages dedicated to the rear securement.

Compatible with Most Vehicles and Chairs

The QRT-360 offers a shortened retractor footprint that allows placement flexibility and better accommodates large chairs by increasing the available space in the securement location. Like other Q'Straint systems, it's compatible with the widest variety of wheelchairs and scooters.

A More Secure Connection, Every Time

With Q'Straint J-hook attachments, operators can achieve a secure attachment on virtually any wheelchair. An updated Positive Lock Indicator provides the operator with clear and certain visual confirmation that the retractor is locked and the vehicle is ready to go. Our patented design eliminates the guesswork when passenger safety is involved. When the indication mark is in-line, the attachment is secure.

Automatic Tightening Increases Safety

Q'Straint's industry-leading self-tensioning system automatically tightens the straps to eliminate any slack created by small wheelchair movements. The belts continue to tighten during low-g vehicle movements, which reduce the potential for dangerous excursions in the event of a collision.

Automatic Release Makes it Easy to Use

Securement is simplified by the compact and ergonomically designed knob. Thanks to Q'Straint auto-release, operators and attendants can pull and secure the wheelchair hook in one step without having to press a release button.

SOLUTIONS FOR EVERY TRANSPORTATION APPLICATION

Personal Mobility

Para-Transit

School/Pupil Transportation

Transit

Motorcoach

Taxi

QRT-1 SERIES

THE SECUREMENT SYSTEM THAT CHANGED EVERYTHING

The original 4-point wheelchair securement system, QRT-1 Series retractors defined the way passenger safety devices are designed and tested.

Solutions for Every Need and Budget

Today, QRT-1 Series retractors provide a full range of options for simple, safe and effective securement of wheelchairs in Para-Transit vehicles, mini-van, rail, city bus, coach bus, and school bus applications.

QRT Max

is a **fully automatic**, knobless retractor offering innovative features that maximize ease of use and ensure passenger safety.

QRT Deluxe

is the world-class original **self-locking** and **self-tensioning** retractable system. The Max and Deluxe models feature a new ergonomic streamlined housing.

QRT Standard

is simple and economical semi-automatic retractor system appropriate for many applications.

QRT-1 Series Specifications

Compatible Anchorages:
Slide 'N Click and L-Track floor anchorages, or may be directly mounted to vehicle floors, seat legs or barriers

Warranty:
3 years (QRT Max, QRT Deluxe);
2 years (QRT Standard)

Testing:
Crash tested to 30mph/20g Impact Test Criteria

Meets or exceeds the following standards and regulations:

- SAE J2249
- ISO 10542
- FMVSS 209, 302, 210, 222
- CMVSS 209
- CSA Z605
- ADA

QRT SERIES-1 FEATURES COMPARISON	QRT MAX	QRT DELUXE	QRT STANDARD
Knobless, One-Handed Operation No knobs to interfere with wheels and footrests.	●		
Dual Tensioning Knobs Provides additional tensioning if needed.		●	
Single Tensioning Knob Provides additional tensioning if needed.			●
Automatic, Self-Locking Allows easy, one-handed hook-up.	●	●	
Self-Tensioning Retractors automatically take up 'slack'.	●	●	
Positive Lock Indicator Patented feature clearly indicates when fitting is locked in anchorage.	●	●	●
Interchangeable Eliminates confusion: no right, left, front or rear locations.	●	●	●
Low Profile & Compact Elimination of mounting bracket allows retractors to fit under most footrests.	●	●	●
Accommodates Larger Wheelchairs Reduced overall retractor length leaves more room for wheelchairs.	●	●	
Universal Design Accommodates virtually all wheelchair designs, including scooters.	●	●	●
Durable Constructed from hardened steel and coated in zinc for maximum corrosion resistance.	●	●	●
J-Hook Reduces twisting of belts and ensures proper securement with a quarter turn accommodating virtually all wheelchair designs.	●	●	●
Foot Release Lever Easy release.	●	●	●

Q'STRAINT

Qstraint.com

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Email: qstraint@qstraint.com

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United Kingdom
Tel: +44 (0)1227 773035
Fax: +44 (0)1227 770035
Email: info@qstraint.co.uk

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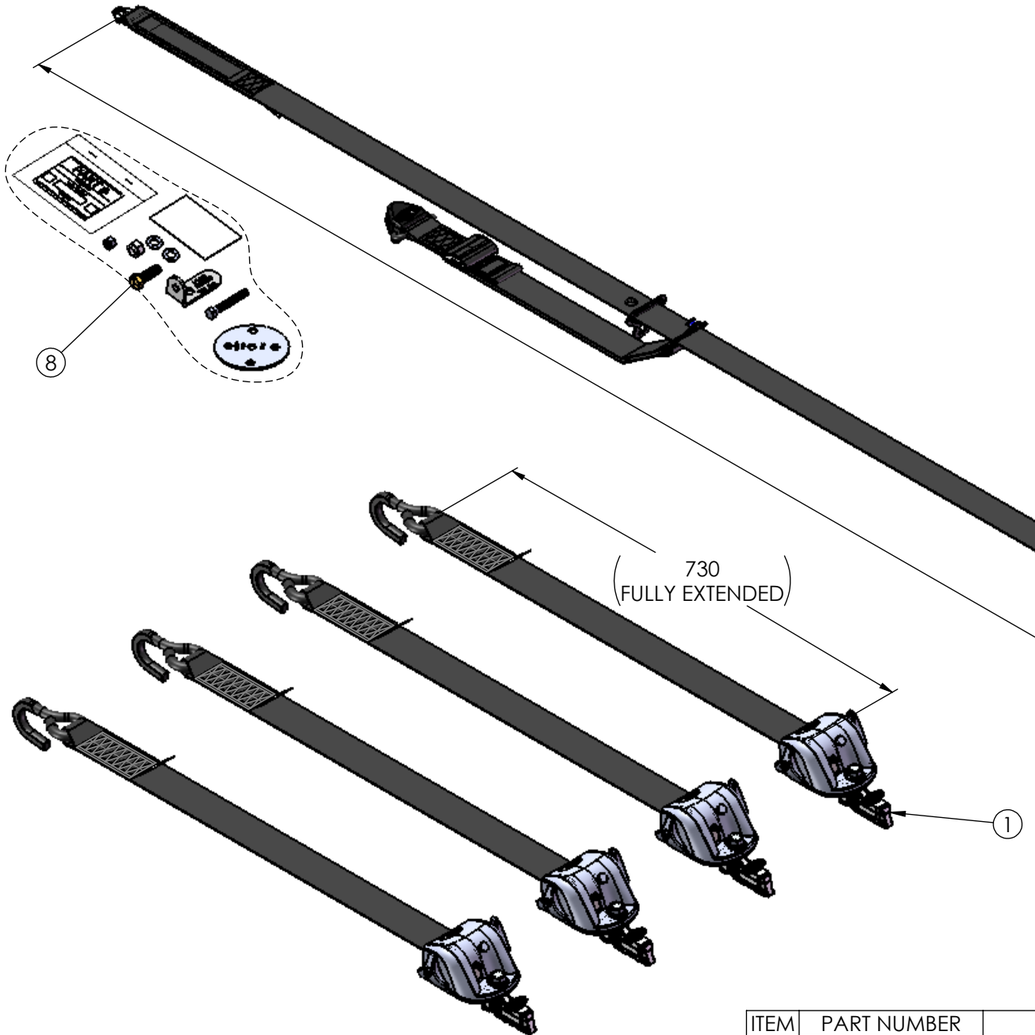
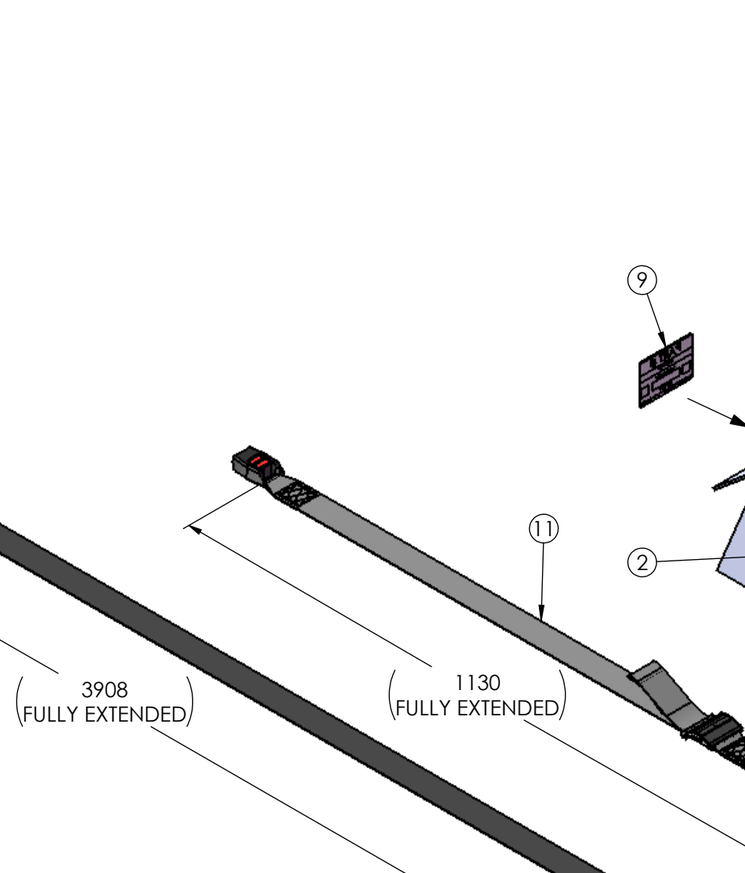
21 Shoebury Street,
Rocklea, Australia, QLD. 4106
Tel: +61 7 3892 2311
Fax: +61 7 3892 1819
Email: info@tramanco.com.au

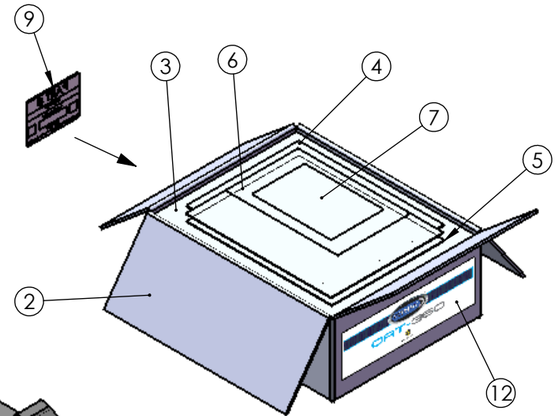
Q'Straint Canada
18-100 Sheldon Dr.
Cambridge, ON N1R 7S7
Tel: 1-800-987-9987
Email: qstraint@qstraint.com

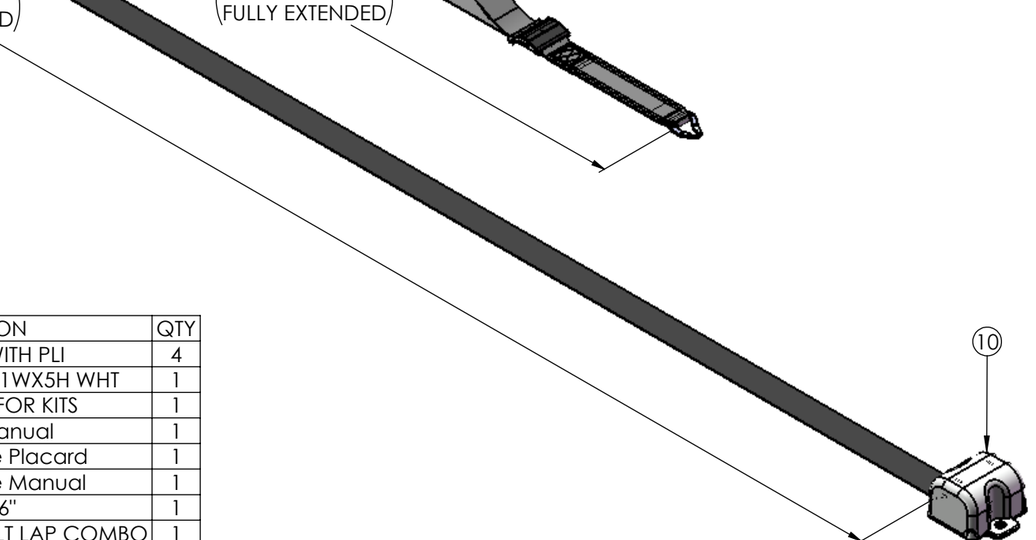
MKM4821 - QRT3

Q-10007	REV	ECN	DESCRIPTION	BY	VERIFIED	DATE
	A	-	INITIAL DRAWING RELEASE.	GS	YT	8/18/2014









ITEM	PART NUMBER	DESCRIPTION	QTY
1	Q011012	QRT-360 ASSEMBLED WITH PLI	4
2	Q5-1110	BOX OYSTER 13 7/8LX11WX5H WHT	1
3	Q5-1130-1	LINER INNER 11X13.75 FOR KITS	1
4	Q5-1150-QRT360	QRT-360 Installation Manual	1
5	Q5-1160-QRT360	QRT-360 Use and Care Placard	1
6	Q5-1161-QRT360	QRT-360 Use and Care Manual	1
7	Q5-2941	WARRANTY CARD 4"X 6"	1
8	Q5-3211-1A	HDW RETCR/SHLDR BELT LAP COMBO	1
9	Q5-3995-B	LABEL 4X3 DIRECT THERMAL BL	1
10	Q8-6323	LAP/SHOULDER BELT COMBO	1
11	Q8-6340	EXTENSION FOR L/S COMBO BELT	1
12	QC99360	QRT-360 BOX STICKER	1

UNLESS OTHERWISE SPECIFIED:
1. ALL PRODUCT CHANGES REQUIRE ENGINEERING APPROVAL.

DIMENSIONS ARE IN mm.
TOLERANCES UNLESS OTHERWISE SPECIFIED:
.X = ±0.50 | ANGLES: ±1°
.XX = ±0.25 | CRITICAL
.XXX = ±0.13 | (REFERENCE)

INITIAL APPROVAL			THIRD ANGLE PROJECTION
DRWN:	GS	8/18/2014	PRINTED COPY UNCONTROLLED
ENGR:	YT	8/18/2014	ASME Y14.5-2009
MFG:	JE	8/18/2014	SCALE: 1:8.1 / SIZE: B / TYPE: U
QUAL:	JG	8/18/2014	

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Q'STRAINT www.qstraint.com

DRAWING TITLE: **KIT QRT-360 COMBO PLI W/ OCC**

DRAWING NUMBER: **Q-10007**

REV: **A**

1 OF 1

NEW YORK SINCE 1907

Rosco was established in 1907. For over a century, our goals have remained the same: We are committed to producing the highest quality automotive products and providing the level of service our customers have grown to expect.

Today, we supply our products to every nearly every fire apparatus and emergency vehicle manufacturer in North America. Our products are designed and largely built in the USA. Our staff has grown to over 250 people in facilities totaling over One hundred thousand square feet.

As we move forward we have set our goals even higher. We are now certified to ISO-9001:2008. Our focus on Total Quality Management and continuous improvement will keep our product quality at levels our customers demand.

We will strive to improve our customer service through online and other electronic resources. We will continue to develop newer and better products to serve the ever-changing needs of the marketplace of tomorrow.

ROSCO® VISION SYSTEMS

A CENTURY OF AUTOMOTIVE VISION SAFETY

90-21 144th Place, Jamaica, New York 11435
TEL (800) 227-2095 • FAX (718) 297-0323
info@roscomirrors.com
www.roscomirrors.com www.roscovision.com

CAT NO. 072916

ROSCO® VISION SYSTEMS

COMMERCIAL BUS

Mirror Assemblies
Mirror Mounts & Arms
Integrated Products
Sun Visors
Continuous & Event Video Recording
Cameras & Backup Safety Products

Rosco Vision Systems

Industries & Products

Industries We Serve

Rosco's standard and custom products are engineered and manufactured for these industries:

Product Matrix

MIRRORS

INTEGRATED PRODUCTS

SUN VISORS

CAMERA & VIDEO RECORDING SYSTEMS

Backup Safety Products

Backup Cameras & Monitors

Safety Starts with a Rearview Camera

We cover all the safety angles so your vehicle can backup safely. Replace a standard rearview mirror with one that displays an LCD image as soon as the vehicle is shifted into reverse. Or install a **Rearview Mirror Backup Camera** that delivers an unobstructed view of what's behind the vehicle even when it's dark outside. Reduce the risks of moving in reverse. Drivers will be able to maneuver easily in reverse with one of our backup camera kits.

STSK7965
Complete Camera Kit

STSC106
Bullet Cam

STSC109B
Rear Look Down or Side Mount

STSC112
License Plate Cam

STSC118
Interior Dome Cam

STSC128
Universal Side Cam

Cameras Types Include:

- Rear look down
- Universal side mount
- Interior dome
- License plate
- Small bullet
- Brake light

Monitor Options Include:

- 5" LCD
- 7" LCD
- Single to quad screen
- Black-lit LCD
- Ultra bright mirror-monitors

STSM206
5" Color LCD

STSM207
7" Color LCD
w/ Quad Screen Capability

Rosco's line of **Integrated Rear Light Backup Cameras** are made for work vans such as the Sprinter, GM/Chevy Express and Nissan NV 1500-3500 series. Enhance safety with these seamless backup cameras suited for your vehicle and engineered to work with most Rosco monitors and mirror monitor combos.

STSC160
Sprinter Cam

STSC162
Nissan NV 1500 - 3500

STSC161
GM/Chevy Express

STSC149
Ford Transit

STSC165
Dodge Promaster

STSC166
Universal Flat Surface

Backup Safety Products

Backup Cameras & Backup Sensors

MOR-Vision Mirror/Monitor Backup Camera Systems

MOR -VISION

Rosco Vision Systems introduces a revolutionary new backup camera system **(STSK4530)** for small to medium vehicles. This new system utilizes an interior rearview mirror **(STSM230)** to display a 4.3" LCD monitor when the vehicle is in reverse operation. This monitor allows the driver to see behind the vehicle, and once the vehicle is shifted to all other modes of operation a normal mirror view reappears.

STSM230

This **STSM230** mirror-monitor is also compatible with the brake light backup cameras **(See STSC160, STSC161, STSC162, STSC149, STSC165, STSC166 on page 11)** for the Sprinter, GM/Chevy Express and Nissan NV 1500-3500 work trucks. The **MOR-Vision** series also includes our **STSK5530 kit**, **STSK6630 kit, and STSK1030 kit** for small and large buses. Buses equipped with **MOR-Vision** have options for multiple cameras and automatic monitor view changes based on operational conditions of the bus.

STSK5530

STSK6630

Backup Safety Sensors

A wireless backup sensor kit alerts drivers to unsafe situations behind a vehicle. Rosco designs flush mount and under-the-bumper backup sensors for a range of applications. Commercial vehicle backup sensors give drivers the information they need for safe reversing to loading dock alignments.

Look to Rosco backup sensors for trucks and other hardworking vehicles. With sensor kits and backup cameras, we deliver rugged tools for smooth driving.

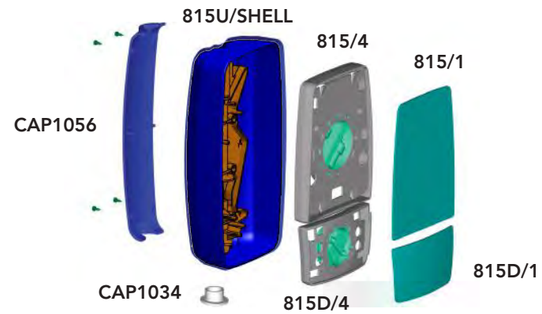
BSSK1001

AccuStyle® 815 Series

Rearview Mirrors

Features and Benefits

- Lightweight.
- Certified by OEM's to meet FMVSS-111 requirements.
- Same model can be mounted as upright, overhang or two point mount.
- Reduces inventory of replacement parts.
- Aerodynamic, wind tunnel tested profile has lower drag coefficient for increased fuel economy.
- Used on all commercial bus types including cutaway, conventional and transit style.
- Available heated, motorized, embedded or external turn signal LED's, chrome.
- Each motorized mirror lens is four way adjustable.
- Hidden wire and connectors.
- Full height rear entry cap allows for simple installation and ease of maintenance including access to wires and harnesses.



AccuStyle® 815 Series 8" x 15" Dual Mirrors

PART NO.	DESCRIPTION
815	8" x 15" dual mirror, two point mount, motorized, 12 volt
815OG	8" x 15" dual mirror, overhang mount, motorized, 12 volt
815SLU OR 815SRU	8" x 15" dual mirror, upright mount, motorized, 12 volt with L or R signal lens LEDs
815SLEU OR 815SREU	8" x 15" dual mirror, upright mount, motorized, 12 volt with exterior L or R signal LEDs
815U	8" x 15" dual mirror, upright mount, motorized, 12 volt
M815	8" x 15" dual mirror, two point mount, hand adjustable
M815OG	8" x 15" dual mirror, overhang mount, hand adjustable
M815U	8" x 15" dual mirror, upright, hand adjustable

*** For Heated Add "H" to the End of All Part Numbers**

Rearview Camera and LED Options

Add Rosco LED Side Marker Lights for Omni-Directional Vehicle Alerts to Other Drivers and Pedestrians.

External Signal LED Detail

Rear Looking Camera

Add Rosco blind spot/wide angle viewing cameras to help driver visibility. The industry's only integrated mirror camera that adjusts positions with the convex mirror lens adjustment (both manual and remote control).

Combo & Interior Mirrors

Rearview & Crossview Assemblies

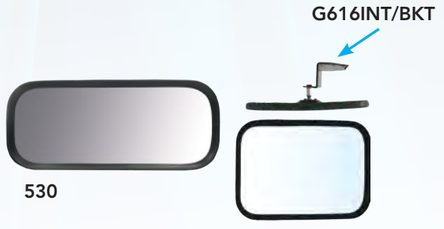
AccuStyle® Rearview & Eye-Max® LP Crossview Combination Assembly

Combination Assemblies

More than one Rosco fender mounted mirror can benefit from the uniquely stable E-Z Bracket® HD mounting base. The **"Combo"** fender mounted mirror design allows both **Rearview and Front Crossview Mirrors** to efficiently install on a common point, thus minimizing holes in the vehicle and maximizing ease of installation, and performance.

Interior Mirrors

- All models manufactured with safety glass.
- Padded edges meet federal and state requirements for safety.
- Available with non-glare glass.
- Many come complete with mounting brackets.
- Powder coated for durability.
- Available in various sizes and mounting configurations.

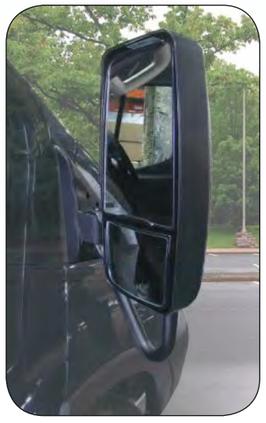


530

609DRYL

630

PART NO.	DESCRIPTION
530	6" x 16" interior mirror, safety glass
630	6" x 30" interior mirror, safety glass
416	4" x 16" interior mirror, safety glass
609D	6" x 9" entrance door convex mirror
609DRYL	6" x 9" entrance door convex mirror w/ 616INT/BKT
616DRYL	7" x 16" entrance door convex mirror w/ 616INT/BKT
355N/355S/355V	6" round flat mirror w/ mounting bracket
362R	12" round convex mirror w/ ball stud mount
601D	6" round convex mirror w/ center ball stud
710	7" x 10" convex mirror



Ford Transit Rearview Mirror

The new **Rosco Ford Transit Rearview Mirror** assembly features our aerodynamic AccuStyle® mirror with a jog down arm. Due to the short, sloped hood, a conventional passenger side fender mounted mirror system is not feasible. Rosco has engineered a (custom) solution utilizing the spacer window between the entry door and front quarter panel for mirror viewing. Windshield mirror viewing options are also available. With a larger viewing surface than the OEM mirror head, the AccuStyle® covers more area around the vehicle to increase safety for the driver and pedestrians around the vehicle.

Fleet Safety Management

Continuous HD Video & Event Recording

P/N: DV440

DUAL-VISION XC4

Rosco's Dual-Vision XC4 has the capacity to identify unsafe driving behavior through its ability to continuously record video and provide instant driver feedback when an event occurs.

KEY FEATURES

- HD Quality Video Recording.
- 720p Forward View Camera, 960H Interior Camera.
- Optional 960H Auxiliary Cameras For a Total of Four Views.
- One-Piece Locking Mounting Bracket Protects SD Card.
- Compatible with Current and Future High-Capacity SD Memory Cards.
- 3,000+ hours of Recording Time per High-Capacity SD Card.
- Built-in Infrared LED's for Excellent Night Interior View.
- Includes DV-Pro® 5 Software.
- Includes Database Management and Alert Notification.
- Optional Auto Download System – Highest Wi-Fi Speeds.
- Optional 4G Cellular Compatibility For Live Tracking and Video Streaming.

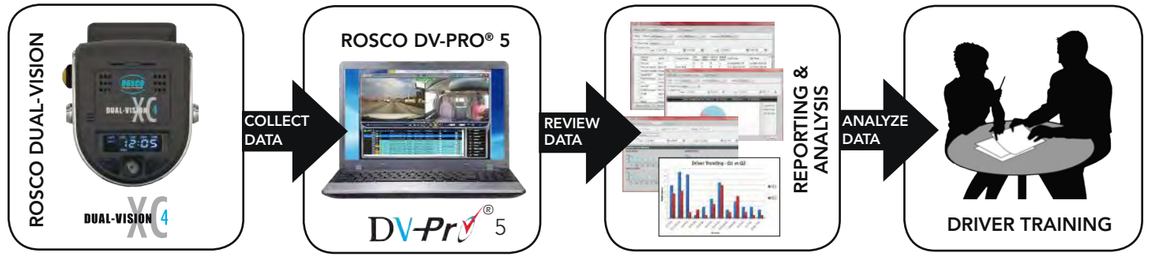
DATA RETRIEVAL OPTIONS

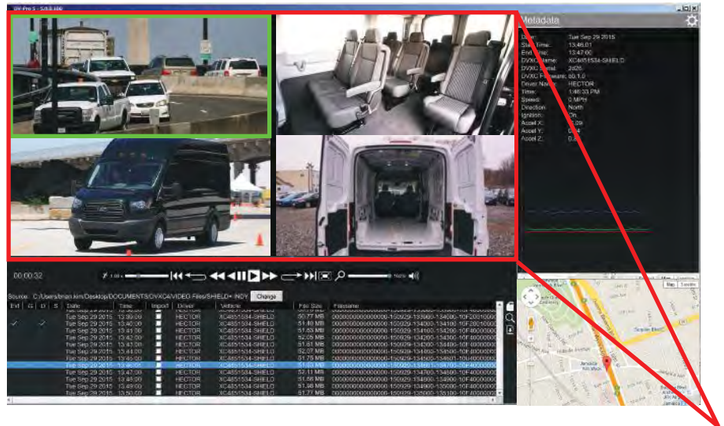
Fleet to remove secured SD card from recorder and view/save video.

Fleet to have Wi-Fi upload of events and/or continuous video upon vehicle return to base.

Fleet to receive real time video clip or .jpg photo data via cellular transmission.

DV-PRO® 5 ADVANCED DATA MANAGEMENT SOFTWARE





Four Camera Quad Screen View

Maximize your data's potential with the **DV-Pro®5 Fleet Database Management System**. This software was developed specifically for organizing information captured by Dual-Vision XC4 recording device. DV-Pro®5 makes it fast and easy to view or transfer recorded data, locate specific events on footage, archive or discard content, and compile reports or email files. DV-Pro® 5 driver tools give greater control of information generated by high capacity Dual-Vision XC4 recorders. You can conduct searches based on detailed criteria and quickly make note of key events such as speed overages.

MOBILEYE®

SHIELD+

Our Solution For Pedestrian and Cyclist Safety

ROSCO® COLLISION AVOIDANCE

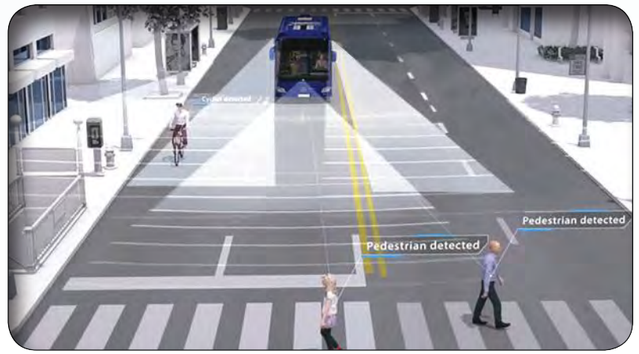
OFFICIAL MOBILEYE PARTNER

www.roscoca.com

The **Mobileye® Shield+ System** is the latest technological advancement for preventing collisions between vehicles and vulnerable road users **(VRUs)** including pedestrians and cyclists. VRUs often are not seen by the bus operator due to large blind spots around the bus, especially when making turns on busy city streets. Bus operating conditions on congested, urban streets demand the highest level of awareness by the vehicle operator. Shield+ increases awareness and safety for the driver and VRUs around the bus to prevent collisions.

Reduce Pedestrian Collisions, Save Lives . . .

In addition to all the benefits of the original **Mobileye® Collision Avoidance System**, this unique, smart vision multi-sensor system provides drivers with alerts when pedestrians and cyclists are in the danger zones on the side of the bus. The addition of the pedestrian and cycle side-sensing makes the driver aware of pedestrians and cyclists in the bus path, before an incident occurs, giving the driver time to react and take corrective action. These alerts can help save lives and improve your organization's safety record.



Interior Components

(3) Driver Alert Displays

(2) Windshield Mounted Smart Sensor Cameras

Exterior Components

(2) Exterior Camera Housings With Smart Sensor Cameras

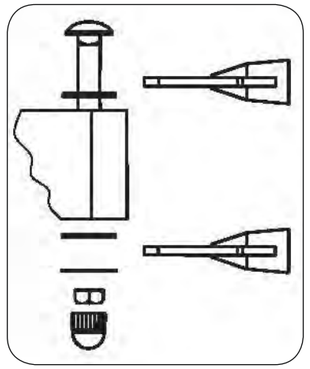
Breakaway Arm Assemblies

Swivel & Spring-Break® Detent

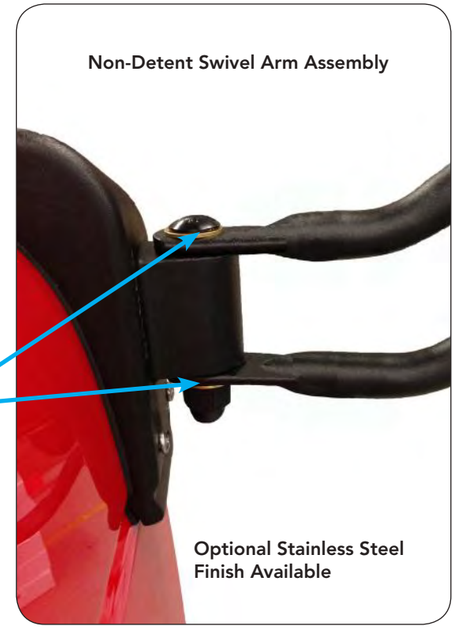
Non-Detent Swivel Arm Assembly

- Rosco's **Non-Detent Swivel Arm Assembly** is the industry standard. It's unique sandwich design provides unparalleled mirror assembly adjustment while being powerful enough to hold positions at highway speeds.

- With infinite adjustability, the vehicle operator can locate the mirror arm and head to an optimal location for each distinctive driver eye-point location.

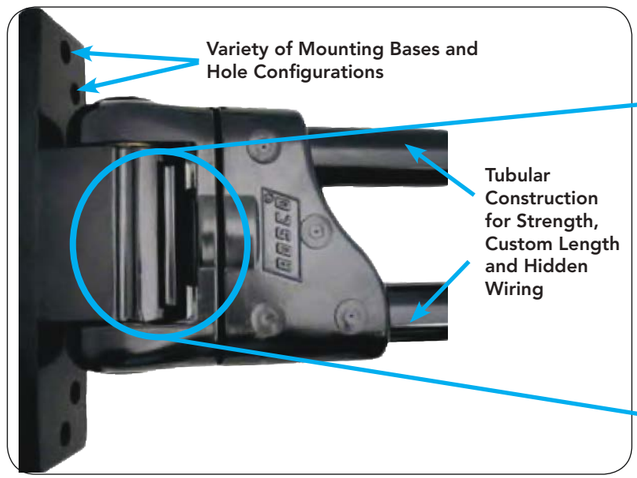


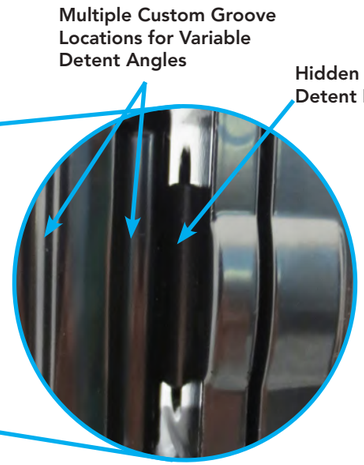
Unique Hinge Design Allows for Wide Range of Swinging Motion Allowing Drivers to Adjust the Position of Arms as Well as Mirrors to Find the Optimal View From the Driver's Seat.



Spring-Break® Detent

This line of mounting arms has a unique **Spring Loaded Detent** mechanism that dampens vibration and keeps the arm locked in position. Heavy-duty cast aluminum mount and swivel provide long lasting reliability and unequaled stability. Tubular construction keeps things economical. Totally maintenance free and offered for Ford, GM, Freightliner and Navistar cutaway buses.





Spring-Break® Detent Detail

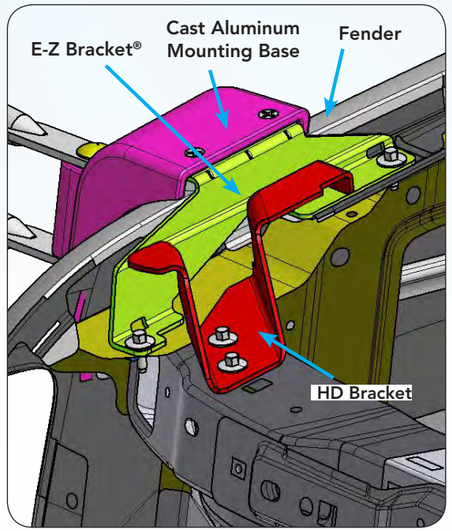
E-Z Bracket®

Heavy Duty Fender Mount

Features and Benefits

- Simple and fast Installation: Rosco's patented **E-Z Bracket® System** makes installation of a Type "A" bus mirror system easier than ever before. (Patent No. 7,055,973). The under-the-fender mount utilizes existing fender mounting bolts to secure the mount below the hood.
  - Rosco's unique ferrule system transfers the strength of the inner heavy-gauge fender wall to the exterior of the vehicle.
  - Installation is completed with two holes instead of as many as twelve.
  - Eliminates the large arms and braces commonly used on passenger side mirror.
- Massive cast aluminum mounting base provides a stable mount for vibration resistance and durability.
- Low-profile construction is aerodynamic and aesthetically appealing.
- Contoured profile matches the fender perfectly for a solid mount that looks great on the vehicle.
- Available for both Ford and GM vehicles.
- Vibration reduction / dual wall tube.
- For Ford E-Series, HD Bracket w/ nose extension.

HD E-Z Bracket® Installation



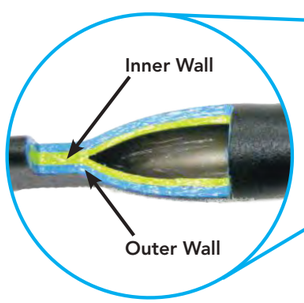
HD E-Z Bracket® Model

Improving Safety & Efficiency

Stronger Arms and More Mirror Options

Dual-Wall Tubing

Dual-Wall Arms have the added strength where it is needed most at the mounting location, but the benefit of thinner wall, light weight performance through the majority of the arm. When coupling all three of Rosco's fender mount weapons… the Dual-Wall Arm, the **E-Z Bracket® HD**, and the **AccuStyle®** lightweight mirror head, the Rosco Mirror "System" has never been stronger in overcoming the many challenges of light weight fenders.



Dual-Wall Tube Detail

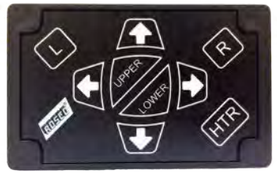
Switches & Harnesses

Control Switches & Wire Harnessing

Features and Benefits

- A variety of **switches**, including heater controls and timers, are available to suit all requirements. **Wire harnesses** are available from stock or in custom lengths, with many different standard and weatherproof connectors.
- A variety of mirror control switches in various sizes to suit every need.
- Heater control switches available in four types with optional heater timer and shut off.

PART NO.	DESCRIPTION
SW-3	Remote mirror control switch, 12V, 1.4" diameter, 12" harness
SW-5	Mirror heater momentary switch, 1" x 0.5"
SW-5-HT	Mirror heater momentary switch, with 10 minute heater timer relay and shut off
HAR5004	2X SW-3 round remote switches & 1X SW5-HT heater remote with timer
HAR5007	2X SW-3 remote switches & 1X SW-5HT heater switch with timer, 10-pin for LED
HAR5012	Switch Plate Assembly, 2 remote switches and 1 momentary heater switch w/ 10 minute heater timer relay, w/ 10 pin connectors for LED turn signal
HAR5013	Switch Plate Assembly, 2 remote switches & 1 momentary heater switch w/ 10 minute heater timer relay



Integrated Membrane switch

HAR5012 (H/R/LED) or HAR5013 (H/R)

SWI2005 Momentary Switch

SWI3003 Toggle Switch

Integrated Membrane Switches

PART NO.	DESCRIPTION
SWI1010	Integrated membrane switch w/ heater timer for remote and heated, vertical configuration, illuminated
SWI1011	Integrated membrane switch w/ heater timer for remote and heated, horizontal configuration, illuminated
SWI1013	Integrated membrane switch w/ heater timer for remote / LED and heated / remote / LED, vertical configuration, illuminated
SWI1014	Integrated membrane switch w/ heater timer for remote / LED and heated / remote / LED, horizontal configuration, illuminated

Ford E-Series Driver Door Mounted Switches

PART NO.	DESCRIPTION
HAR5020	Switch Pod w/ toggle heater switch, red illuminated and 2 remote switches
HAR5024	Switch Pod w/ toggle heater switch, red illuminated
HAR5029	Switch Pod w/ momentary heater switch (green), timer, 2 remote switches
HAR5032	Switch Pod w/ momentary heater switch (green), timer, 2 remote switches, 10 pin connectors for LED mirror turn signal

HAR5020

LED DISPLAY DATA SHEET
MATRIX: 72x10
Product code: DD096

MECHANICAL DATA	
Case dimensions (excluding brackets):	29 1/4 x 6 1/4 x 2" / 743 x 159 x 49.5mm (l x h x d)
Viewing area:	27 1/4 x 4" / 692 x 102mm (l x h)
Sign construction:	Punched and folded aluminum case (no welds), for increased strength, no louvers required. Matte black, powder coat finish.
Weight:	11.4lbs / 5kg
Cable exit points:	Top left, top right, bottom left, bottom right (to be specified at time of order)

DISPLAY DATA	
Maximum character height:	4" / 102mm
Text format:	Static, paging or scrolling, 1 line
Font options:	Hanover fonts as supplied with Helen programming software plus Windows™ fonts
Display technology:	High visibility LEDs (with integrated ambient light sensor control (full linear range from 10-100% range))
Communication interfaces:	RS485 (standard). J1708, RS232, IBIS, Ethernet (via display controller)

LED SPECIFICATION	
Lifespan (to ½ brightness):	100,000 hours MTBF (LED manufacturer's data)
Size and type:	1/8 x 5/32" / 3.2 x 4.0mm (w x h) oval through-hole
Dominant color wavelength:	Amber 588 - 594nm (typically 591nm)
Pitch:	Horizontal: 3/8" / 9.7mm - vertical: 13/32" / 10.2mm
Viewing angle (horizontal):	120°

ELECTRICAL DATA	
Operating voltage:	24v DC nominal (18-32v)
Typical power consumption (33% on at 100% brightness):	6 watts (0.26A measured at 24v)
Maximum power consumption (all on at 100% brightness):	10 watts (0.43A measured at 24v)
Electrical protection:	Anti-surge, reverse polarity
Display processor fuse rating:	5A quick blow

OPERATIONAL DATA	
Temperature range (storage):	0 - 140°F (0 - 180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 10 years against faulty materials and/or workmanship.
Buy America compliant – Signs (including casework and PCB's) are all manufactured in the USA.
Hanover Displays LED signs meet Automotive EMC Directive ECE R10 as amended. Certificate N°E11 10R-046100.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL 60007
T +1 (773) 334 9934
www.hanoverdisplays.com

LED DISPLAY DATA SHEET
MATRIX: 96x15

Product code: DD012

MECHANICAL DATA	
Case dimensions (excluding brackets):	38 1/2 x 8 1/4 x 2" / 976 x 210 x 50mm (l x h x d)
Viewing area:	37 1/4 x 6" / 946 x 152mm (l x h)
Sign construction:	Punched and folded aluminum case (no welds), for increased strength, no louvers required. Matte black, powder coat finish.
Weight:	9.7lbs / 4.5kg
Cable exit points:	Rear panel, top left, top right, bottom left, bottom right (to be specified at time of order)

DISPLAY DATA	
Maximum character height:	6" / 152mm
Text format:	Static, paging or scrolling, 1 or 2 lines
Font options:	Hanover fonts as supplied with Helen programming software plus Windows™ fonts
Display technology:	High visibility LEDs (with integrated ambient light sensor control (full linear range from 10-100% range))
Communication interfaces:	RS485 (standard). J1708, RS232, IBIS, Ethernet (via display controller)

LED SPECIFICATION	
Lifespan (to ½ brightness):	100,000 hours MTBF (LED manufacturer's data)
Size and type:	1/8 x 5/32" / 3.2 x 4.0mm (w x h) oval through-hole
Dominant color wavelength:	Amber 588 - 594nm (typically 591nm)
Pitch:	Horizontal: 3/8" / 9.7mm - vertical: 13/32" / 10.2mm
Viewing angle (horizontal):	120°

ELECTRICAL DATA	
Operating voltage:	24v DC nominal (18-32v)
Typical power consumption (33% on at 100% brightness):	12 watts (0.48A measured at 24v)
Maximum power consumption (all on at 100% brightness):	20 watts (0.83A measured at 24v)
Electrical protection:	Anti-surge, reverse polarity
Display processor fuse rating:	5A quick blow

OPERATIONAL DATA	
Temperature range (storage):	0 - 140°F (0 - 180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 10 years against faulty materials and/or workmanship.
Buy America compliant – Signs (including casework and PCB's) are all manufactured in the USA.
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www.hanoverdisplays.com

DRIVER CONSOLE DATA SHEET
DERIC G3
Product code: DG3

MECHANICAL	
Case dimensions (w x h x d):	$4^{1}/_{8}$ x 2 x $4^{3}/_{4}$" / 105 x 48 x 121mm
Mounting cut-out dimensions (w x h):	$3^{5}/_{8}$ x $1^{3}/_{4}$" / 92 x 45mm
Mounting type:	Dashboard/panel using DIN clamps or screw fixing
Approximate weight:	1.1lbs / 0.5kg
Driver interface :	4 button function/navigation keypad

DISPLAY	
Display size (w x h):	$2^{3}/_{4}$ x $^{3}/_{4}$" / 71 x 19mm
Display format:	256 x 64 pixels, multi-line or graphics including sign mimic
Display technology:	High resolution amber OLED with automatic screen dimming

DATA STORAGE	
Memory capacity:	8MB
Dual database capacity:	Timed update triggered by programmable real-time clock
Data loading:	USB storage device via front panel socket

COMMUNICATIONS, INPUT/OUTPUT	
Sign communications:	RS485 (standard communications with Hanover signs)
Secondary communications:	J1708 (std), RS232, RS485, isolated RS485, IBIS (optional)
Digital input/output:	1x digital output 2x digital inputs
Piezo sounder:	Monophonic multi-note sounder

ELECTRICAL	
Operating voltage:	9-36Vdc
Typical power consumption:	3.6 watts (0.15A measured at 24V in testing signs mode)
Electrical protection:	Reverse polarity and transient

OPERATIONAL	
Temperature range (storage):	0 – 140°F (0-180°F) / -20° to +60°C (-20° to +80°C)
Humidity:	95% max

Product guaranteed for 10 years against faulty materials and/or workmanship.
Buy America compliant – Driver Consoles are all manufactured in the USA.
Hanover Displays DG3 meet Automotive EMC Directive/ ECE R10 as amended. Certificate N°E11 10R-045763.
ADA, Equality Act 2010, PSV Accessibility Regulations & Annexe 11 compliant.

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1601 Tonne Road
Elk Grove Village, IL, 60007
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KEYLO & BASE STATION DATA SHEET

Product code (Keylo): KF001
Product code (Base station): KFBS001

The Keylo has been developed to make the process of transferring destination lists to vehicle-based controllers more convenient. It offers the additional advantages that it is small, portable and robust and fits easily into the user's pocket. In addition, no transfer cable is required.

In conjunction with its partner Base Station and the HELEN destination list software, data can be quickly and easily loaded into the Keylo. The Keylo can then be taken to the desired controller(s). Once plugged, the transfer of data to the controller is handled automatically.

The Keylo is for use with computer USB ports and self-powered hub ports.

Supported features:

- Timed updates
- Container files and profiling using the profile (PF) parameter in the controller
- Firmware upgrades to the controller

MECHANICAL DATA	
Unit size (Keylo):	W34mm x H50mm x D15mm
Weight (Keylo):	50g
Unit size (Base station):	W50mm x H30mm x D87mm
Weight (Base station):	200g
Memory size dataflash:	32Mbit (4MByte)

PC HARDWARE & SOFTWARE COMPATIBILITES	
Computers:	PC compatible
Operating system:	Windows 7, 8, 10
Standard communications:	USB compatible, all standards
HELEN software:	Version 3.3 or later Please contact Hanover for the latest HELEN software

CONTROLLER COMPATIBILITIES	
Controllers:	ERIC++ controllers DERIC+ controllers
Connection to ERIC++/DERIC+ controller:	Via the front panel 9-way connector

OPERATIONAL DATA	
Temperature range:	0°C to +70°C

Disclaimer: Details subject to change.

540022-5

Hanover Displays Ltd
Southerham House, Southerham Lane
Lewes, East Sussex BN8 6JN United Kingdom

T +44 (0)1273 477 528
sales@hanoverdisplays.com
www.hanoverdisplays.com

Registration No. 1876684
VAT No. GB412494663

Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL 60007
T +1 (773) 334 9934
www.hanoverdisplays.com

HANOVER DISPLAYS WARRANTY POLICY

HANOVER DISPLAYS warranty obligations are limited to the terms set forth below.

NEW MANUFACTURED PRODUCTS LIMITED WARRANTY:

HANOVER DISPLAYS guarantees that each product is free from defects in material and workmanship.

HANOVER DISPLAYS also guarantees the performance of their products for the following periods from original ship date from HANOVER DISPLAYS:

Amber LED (on-board & wayside) systems and On-board Next stop signs: 12 years.
White & Color LED systems: 5 years
Audio-Visual TFT systems: 2 years

If the product fails to operate as specified and has not been tampered with or abused during this warranty period, HANOVER DISPLAYS shall have the option to repair or replace any defective part or the product free of charge. Such services by HANOVER DISPLAYS shall be the original purchaser's sole and exclusive remedy.

This warranty does not apply: (a) to damage caused by accident, abuse, misuse, misapplication or improper installation (b) to damage caused by conditions outside the manufacturer's specifications including but not limited to vandalism, fire, water, temperature, humidity, dust or other perils (c) to damage caused by service (Including upgrades) performed by anyone who is not a HANOVER DISPLAYS authorized technician (d) to a product or a part that has been modified without the written permission of HANOVER DISPLAYS or (e) if any HANOVER DISPLAYS serial number has been removed or defaced.

HANOVER DISPLAYS shall not be liable for the cost of removal or installation of products nor shall HANOVER DISPLAYS be responsible for transportation costs.

HANOVER DISPLAYS shall not be liable for any special, incidental or consequential damages for loss, damage directly or indirectly arising from customer's use or inability to use the equipment either separately or in combination with other equipment, or for personal injury or loss or destruction of other property, or from any other cause.

HANOVER DISPLAYS WARRANTY POLICY (continued)

WARRANTY REPAIRS - A replacement or repaired product assumes the remaining warranty of the original product. When a product or part is exchanged, any replacement item becomes the original purchaser's property and the replaced item becomes Hanover Displays property.

OBTAINING WARRANTY SERVICE - The original purchaser is responsible for returning any defective products to HANOVER DISPLAYS upon obtaining a Returned Merchandise Authorization (RMA) number from our Customer Service Department. No items will be accepted without an RMA number. Be sure to have the serial number of the equipment to hand.

The original purchaser must package the product properly. HANOVER DISPLAYS is not responsible for any damage to the product caused during transit or for any package lost by the shipping company.

The original purchaser assumes all cost in shipping the defective product to HANOVER DISPLAYS and HANOVER DISPLAYS will assume the cost in shipping back to the customer. All replacement/repaired products are shipped UPS Ground unless a rush is requested. The cost of shipping using any other mode other than UPS Ground is to be paid by the original purchaser.

Ship to: Hanover Displays Inc.
1601 Tonne Road
Elk Grove Village, IL, 60007

NON-WARRANTY REPAIR POLICY:

Non-warranty repairs made by HANOVER DISPLAYS carry a limited repair warranty of 90 days on services and replacement parts only. Defects in repair work or any parts replaced will be corrected at no charge if the defect occurs within 90 days from shipment from our facility.

FIELD SERVICE:

Field service calls will be made to customer's facility upon request. Time, expenses, and materials will be charged at standard rates unless other arrangements are made in advance. Field Service is treated as any repair. All travel must be pre-approved and is based upon actual prevailing airfare, hotel/motel rooms and Per Diem rates.

HANOVER DISPLAYS WARRANTY POLICY (continued)

NON-HANOVER DISPLAYS EQUIPMENT RECEIVED FOR REPAIR:

Items received for repair that were not manufactured or supplied by HANOVER DISPLAYS will be logged in and HANOVER DISPLAYS will require that the customer supply us with their shipper number in order to return the item.

ADA STOP REQUEST INFORMATION

The ADA Occupant Stop Request Lights the Blue Side of the Sign and Signals Driver of an ADA Stop Request via Touch Tape Switches.

Ambulatory Stop Requests Light the Red Side of the Sign and Signals the Driver via Pull Cords.

Fare Box Provision

Any fare box can be mounted to the floor of our product in a multitude of locations that can be determined during a pre-build. A 12v up to 30 amp circuit is provided for any fare box to be used in the industry.

BEACONS

3000 Series Strobe

REPLACE (x) AND (xx) IN ORDER NUMBER FOR PERSONALIZED SELECTIONS

Product Number: 3 (xx) 7(x) (x) (x)

Watt Options: 1Ø = 10 Watt or 2Ø = 20 Watt

Flash: 7 = Double and Quad (included in product number)

Height Options: L = Low, 4" Dome or H = High, 6" Dome

Mounting Options: C = Flat/Pipe or M = Magnetic

LED Color/Dome Color Options: A = Amber LEDs/Amber Lens C = White LEDs/Clear Lens

Features

- Lens with UV inhibitor prevents sun fade
- Rated to last 20,000+ hours
- Advanced circuitry designed tolerate high vibration applications

accessories

Branch Guard and Dust Cover (Beacon not included)

Branch Guards (6" shown)

4" Height #PESB41BG4

6" Height #PESB41BG6

Dust Cover

6" Height #E36ØDC6

TECHNICAL SPECIFICATIONS

FLASH PATTERNS	2 flash patterns - double or quad (user selectable)
TECHNOLOGY	Xenon Helix Strobe Tube
INPUT VOLTAGE	10-30 Vdc
CURRENT DRAW	10 Watts: 1 Amp @ 12 Vdc, 0.5 Amps @ 24 Vdc or 20 Watts: 2 Amps @ 12 Vdc, 1 Amp @ 24 Vdc
OPERATING TEMPERATURE	-40° C to 50° C
DIMENSIONS	4" Dome with base: 4.75" (12 cm) H 6" Dome with base: 6.7" (17 cm) H x 6.3" (16 cm) base diameter
MOUNTING	Permanent or Magnetic mount (polycarbonate lens and black base)
CERTIFICATIONS	SAE J 1318 Class 2 certified
WARRANTY	Two-year (strobe tube, one-year)

From:	Jerry Cavanah
To:	Marcus Hoffman
Subject:	FW: West Virginia PRO-VISION Video Specs AND WARRANTY
Date:	Thursday, August 2, 2018 7:00:53 AM

Jerry Cavanah
Starcraft/StarTrans div. of
Forest River, Inc
PH: 574-360-0072
jcavanah@forestriverinc.com
www.starcraftbus.com

From: Corey Mathews [mailto:corey.mathews@provisionusa.com]
Sent: Tuesday, July 24, 2018 4:41 PM
To: Jerry Cavanah <jcavanah@forestriverinc.com>
Cc: Lance A. Yoder <LAYoder@forestriverinc.com>
Subject: RE: West Virginia PRO-VISION Video Specs AND WARRANTY

Jerry,

I have updated he quote below. Thanks for the information.

I have put together a comprehensive list of PRO-VISION part numbers and prices that, based on the provided specification, Section 3.44 (security Camera System).

1. **The below quote meets the specification.**
2. **Lead Time is 1 week.**
3. **Warranty is 5 years**

QUOTE # MASQ8988

PRO-VISION® 16 Channel Solid State Video Recording System Features:
• 16 Channels of HD Video & Audio
• 1080p True High Definition Video
• Rugged Solid State Design
• Wireless File Transfer
• 5 YEAR System Warranty
• LIFETIME SDXC Card Warranty
• GPS Route History
• Stop-Arm Solution
• Smart-Secure™ High Capacity Storage
• Unbeatable Value

The following is pricing for your specific application:
(5 Camera) PRO-VISION® 16 Channel Solid State Video Recording Systems Include:
• DVR-808-128 1080p HD Base Kit with Single Camera [128GB]
• DVR-813 HD Forward Facing Camera KIT
• DVR-818 HD Wide Angle Interior Camera Kit

• DVR-810 HD Night Vision Dome Camera KIT
• DVR-810 HD Night Vision Dome Camera KIT
• DVR-810 HD Night Vision Dome Camera KIT
• DVR-710 Enhanced Event Marker Button
• DVR-750 GPS Antenna
• PX-1843 30ft HD Extension Camera Cable
• PX-1843 30ft HD Extension Camera Cable
• HD Night Vision Dome Camera (Included in DVR-808)
• Solid State DVR (Included in DVR-808)
• 128GB Class 10 SDXC Memory Card (Included in DVR-808)
• Lockable Cage (Included in DVR-808)
• 20ft HD Camera Cable (Included in DVR-808)
• Software & Guides (Included in DVR-808)

General Terms:
PRO-VISION®, Inc. ships all orders UPS Ground.
Service or carrier change will result in additional charges.
Shipping & Handling not included unless specified.
Quote is valid for 30 days. Purchase price is USD and FOB Byron Center, MI
Product Invoice Net 30 Day Terms or 2.0% Discount Net 10 Day Terms. (excludes installation)
5% Discount when 100% payment is received with purchase order (Excludes SecuraMax Server)
Terms and Discounts do not apply to leases or credit card payments
50% Deposit Required for Installation. Final Installation/Service Payment is due on Receipt of Invoice
Product to be installed by PRO-VISION® and Service Deposit must be paid for prior to scheduling of install/service work
Minimum Service Deposit Required for Service Work
Install rates based on a single location with minimum access of 12 hr/days, 7 days/ week
Additional fees may apply if installation location does not comply with our defined service facility requirements.
Past due invoices will be subject to a 1.5% per month Finance Charge
No technical support or warranty claims will be provided for any past due account
All transactions are subject to final PRO-VISION® Management Approval.

Corey Mathews
SALES MANAGER
TRANSIT GROUP

***PRO-VISION®* Video Systems**
T: 800.576.1126
F: 616.583.1522
www.provisionusa.com

SEEING IS SAFETY®

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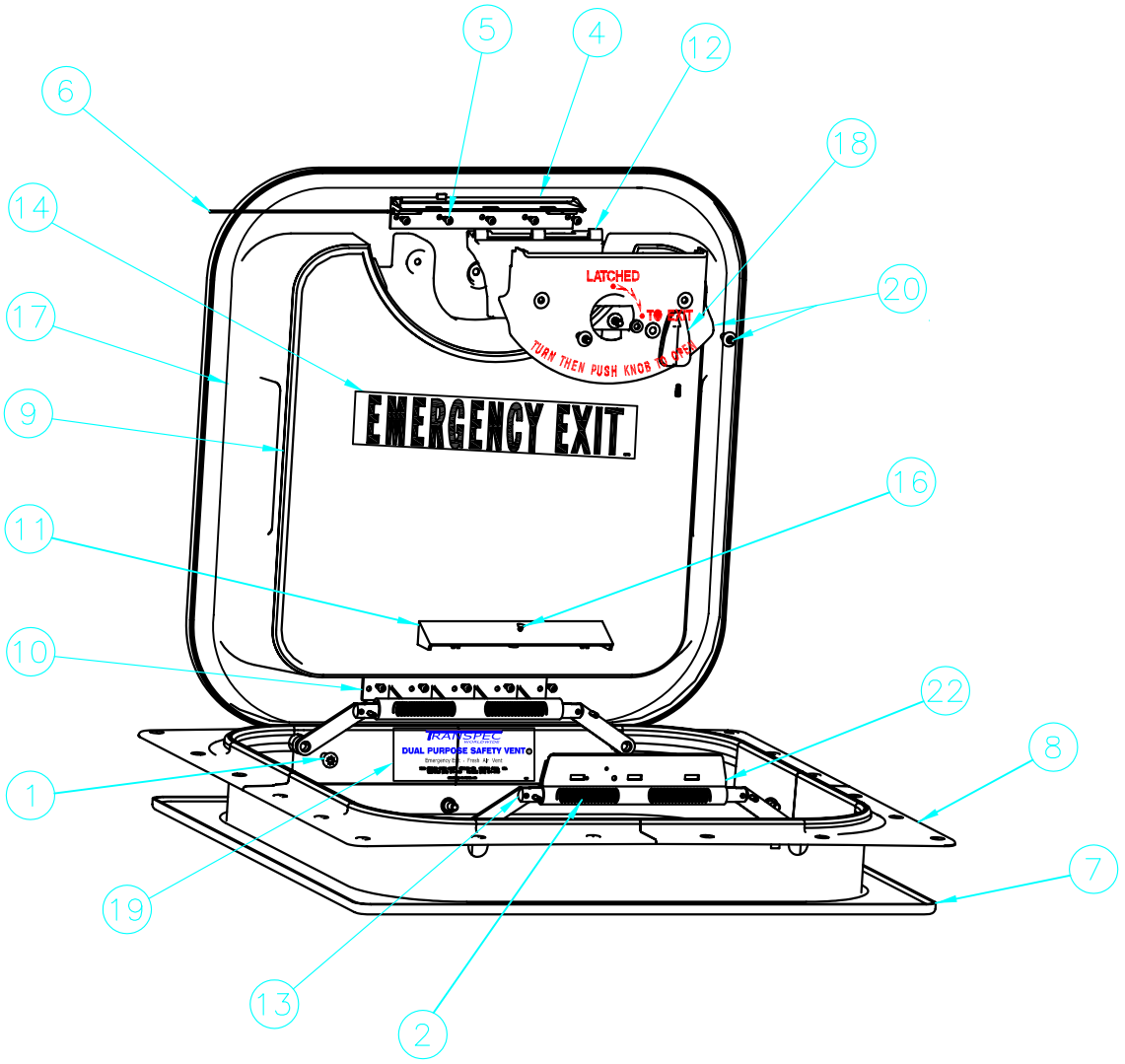


	ITEM NO.	PART NO.	DESCRIPTION	QTY.
	1	2030	SHOULDER BOLT	4
	2	2040	PLUNGER SPRING	4
*	4	2070	HANDLE BASE WHITE	1
*	5	2100	SPECIAL SCREW, TORX HI-LO	10
*	6	2140	HINGE PIN	1
	7	2220-4-001	TRIM MOLDING #4 WHITE TRIMMED	1
	8	2250	FRAME #4 LOW PROFILE WHITE	1
*	9	1075	LID DUAL PURPOSE SAFETY VENT II WHITE	1
*	10	2050	FIXED HINGE WHITE	1
*	11	2055	HINGE COVER WHITE	1
*	12	1000-003	RELEASE HANDLE ASSY. WHITE	1
	13	1000-005	LINK & PLUNGER ASSY.	4
*	14	2572	DECAL EMERGENCY EXIT	1
*	16	2105	SCREW #8 x 1/2 S/S FLAT HEAD	1
*	17	1000-017	EXTRUDED GASKET KIT	1
*	18	1077-014	RELEASE ASSEMBLY INNER	1
	19	2670	DECAL-DUAL PURPOSE SAFETY VENT II	1
*	20	1975-015	RELEASE HINGE SHIELD ASSY. WHITE	1
	22	2060	RELEASE HINGE WHITE	1

	ASSEMBLY #	REPLACEMENT LID ASSEMBLIES (*)	QTY.
	1075L-000-001	LID ASSEMBLY DPSV WHITE	

(*) Lid with fixed hinge, release hinge, handle, gasket and decals

REV	DESCRIPTION	DATE	BY	APV'D

MATERIAL: SEE DETAILS

DR. PHENG LEE | DATE 01/29/04

TOLERANCE:
UNLESS OTHERWISE SPECIFIED
INCH: .X=±.020 .XX=±.010 .XXX=±.005
METRIC: .X=±.5MM .XX=±.25MM .XXX=±.13MM
ANGLES=±1°

ENGR. R.J.IMINSKI | SCALE NONE

TRANSPEC WORLDWIDE
7205 STERLING PONDS COURT
STERLING HTS MICHIGAN 48312 USA

DUAL PURPOSE SAFETY VENT II
#4 SWEEP, ENGLISH, WHITE

FIRST USED ON: NP-161

PART NO. 1075-004-001

ASAP

Training

Creative Bus Sales understands and is prepared to meet the training requirements as outlined in section 3.51.

If any further information is need please let us know.

FEATHER WEIGHT

HIGH-BACK SEAT

Freedman Seating Company's Feather Weight seats are designed to be like feathers on a bird: light and airy to satisfy weight restrictions and ensure a smooth ride, yet durable for years of service and low maintenance.

Freedman Seating Feather Weight seats are the most severely tested in the company's history, and meet all applicable federal motor vehicle safety standards for strength and safety (including 210 for seat belts). Less weight means one thing to bus builders and operators: they can get more passengers per bus. And when we say more passengers, ***we mean more happy passengers.***

Not Just Seats

Seating Solutions™

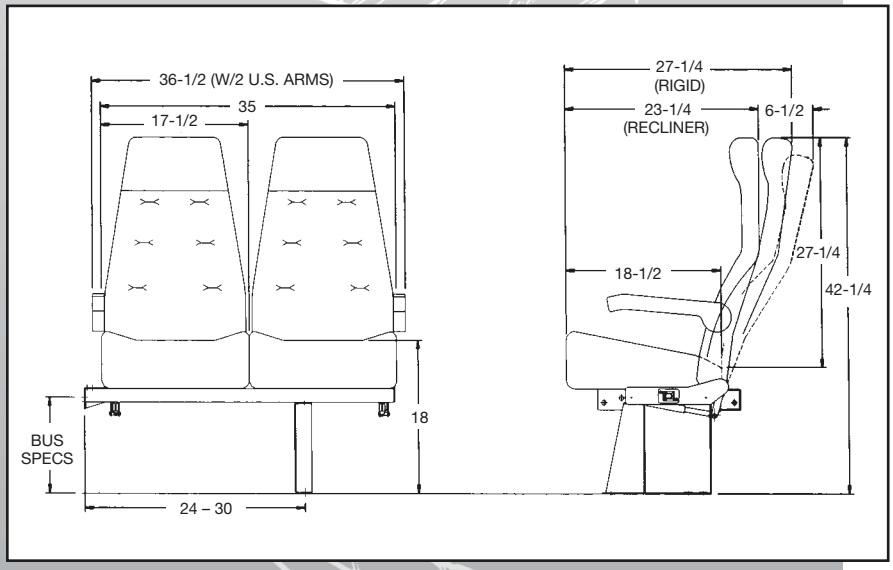
THE FEATHER WEIGHT SERIES BY

FREEDMAN SEATING COMPANY

an ISO 9001:2000 certified company

FEATHER WEIGHT

HIGH-BACK SEAT



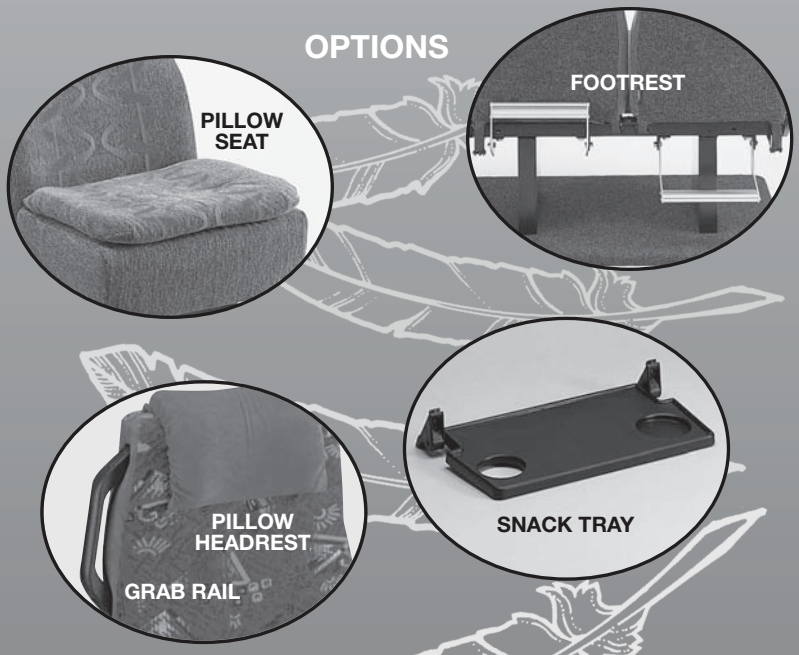
Cross-country or cross-town, the Freedman Feather Weight High-Back gets you there in safety and comfort. The headrest actually cradles your head, and provides unrestricted viewing. The ultra-thin backrest gives out-standing support and creates more hip-to-knee room than any other seat in its class. The steel frame system meets or exceeds all applicable government standards for safety and durability. And, it's light as a feather!

Feather Weight High-Back features include:

- An ultra-thin *Knee-Saver* type backrest for added hip-to-knee room and lumbar support
- Molded polyurethane seat and back cushions for comfort and long lasting support
- 17½" wide seat cushions
- 27¼" back height off the seat cushion, 42¼" off the floor
- Wire mesh-grid seat springs for even support
- FMVSS 210 compliance–all *Feather Weight* seats are seat belt ready
- Covers that can be removed and replaced easily and without the use of special tools

Feather Weight High-Back options include:

- Black molded *U.S. Arms* or upholstered flip-up armrests
- Mesh map pockets
- Vertical stitching
- FTA foam
- Snack trays
- Aluminum folding footrests
- Pillow seat cushions
- Pillow headrests
- Side grab rail
- U.S.R.—Under Seat Retractors
- 16" or 19" wide seats available
- Rear row quick disconnect
- CRS-225 hooks and tethers
- Side sliders
- Cup holders
- Seat belt loops



Not Just Seats™

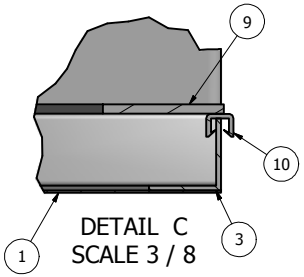
THE FEATHER WEIGHT SERIES BY

FREEDMAN SEATING COMPANY

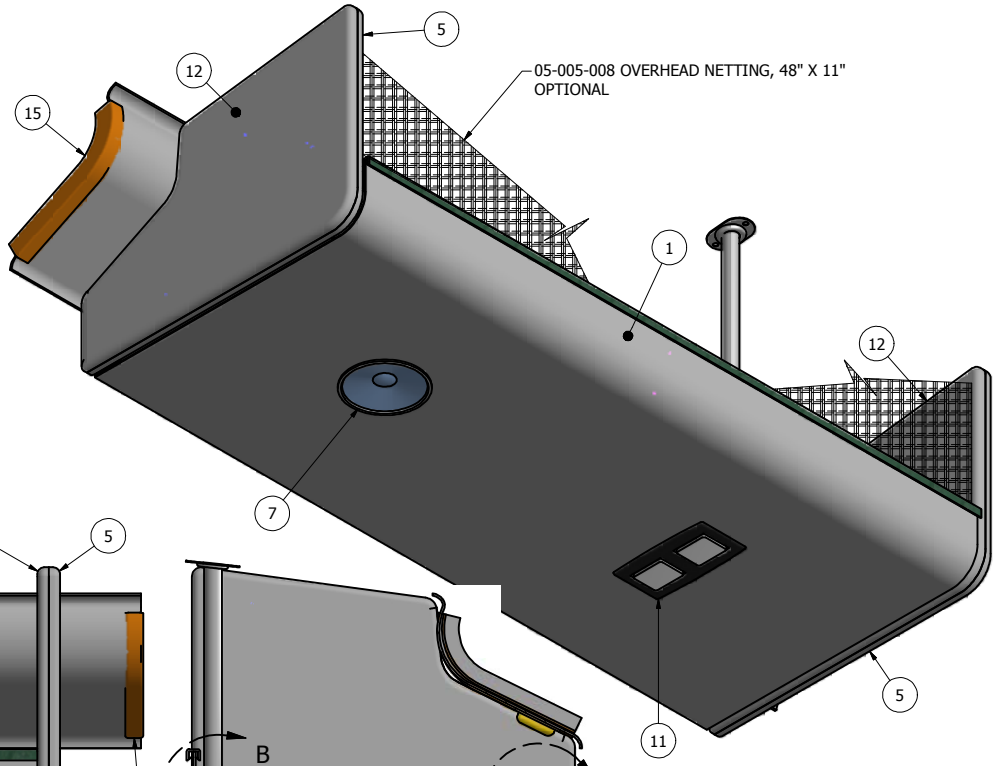
an ISO 9001:2000 certified company

4545 W. Augusta Blvd., Chicago, IL 60651
(773)524-2440 (800)443-4540 Fax: (773)252-7450
WWW.FREEDMANSEATING.COM
e-mail: sales@freedmanseat.com

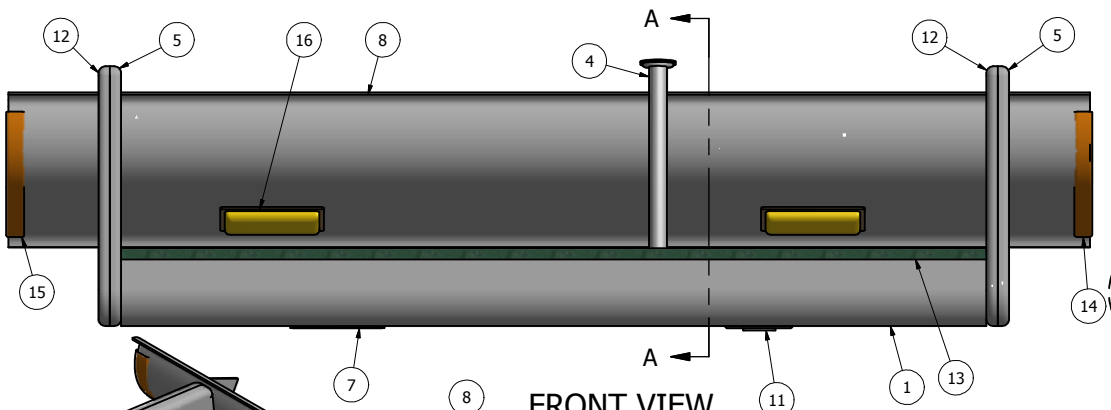
We are constantly updating and improving our seats; therefore we reserve the right to change or modify specifications or materials without notice. All Freedman Seating Company seats meet or exceed FMVS standards.



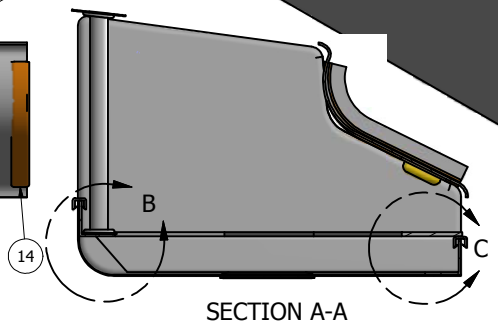
DETAIL C
SCALE 3 / 8



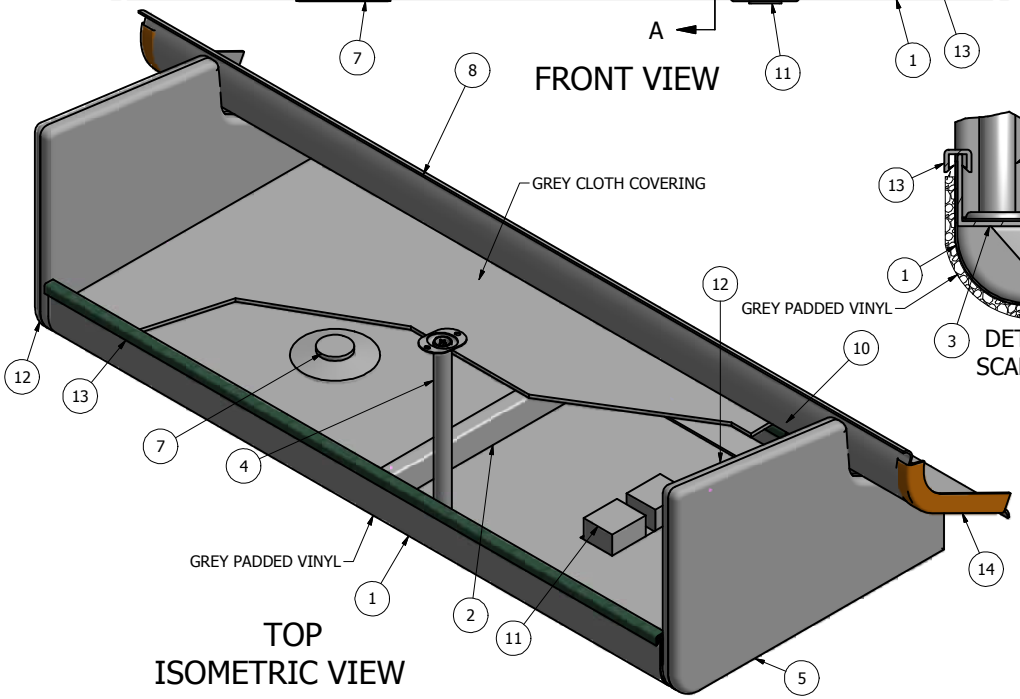
BOTTOM
ISOMETRIC VIEW



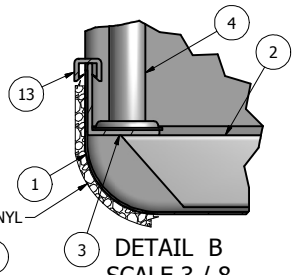
FRONT VIEW



SECTION A-A
SCALE 3/16



TOP
ISOMETRIC VIEW



DETAIL B
SCALE 3 / 8

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	48 ALUM CURV	.060 ALUMINUM 24" x 48"
2	3	1x2x20.125 Alum. Cut	Aluminum Tube 11ga. 1"x 2"x 20-1/8" ANGLE CUT
3	2	2x2x48 Alum.	ALUMINUM ANGLE 16ga.x 2"x 2"x 48" lg. A-513
4	1	31-28-0162-07	STANDARD OVER HEAD LUGGAGE STANCHION
5	2	30-005-007 R	LUGGAGE RACK END CAP,GREY VINYL RIGHT
7	1	08-009-016	OPTIONAL SPEAKER,JENSON 5 1/4" PREMIUM SOUND
8	1	30002002	D/S TRANSITION PANEL 181"
9	1	11021095	LUAN
10	1	07001193	TRIM LOCK 1/2" LUGGAGE RACK TRIM
11	1	08-007-028	OPTIONAL LIGHT, DOUBLE READING LIGHT
12	2	30-005-007 L	LUGGAGE RACK END CAP,GREY VINYL LEFT
13	1	48 GIMP	TRIM LOCK 1/2" LUGGAGE RACK TRIM
14	1	21-004-003	Valance End Cap Right
15	1	21-004-003 L	Valance End Cap Left
16	2	08-008-059	Driver Dome Lamp Interior Entry 4" LED

FOREST RIVER BUS

DFTSN:	TAS	TITLE	OVERHEAD LUGGAGE ASSEMBLY
DATE:	08/01/18	DWG NO 31-28-1343-18	SHEET 1 OF 1

Warranty Provider Locations

Fleetpride
3204 Maccorkle Ave SW, South
Charleston, WV 25303

Matheny Motors
50 Matheny Lane
Mineral Wells, WV 26150

Matheny Motors
4125 1st Ave
Nitro, WV 25143

Matheny Motors
1375 US Rt 52
Kenova, WV 25530

FOREST RIVER COMMERCIAL BUS
WARRANTY WEST VIRGINIA – BID

NOTICE

Please return the warranty registration card to register the warranty with STARCRAFT BUS so that Starcraft Bus may record your rights under this limited warranty and to assure prompt assistance. Your dealer will provide the warranty card for you to sign. If you do not remember signing a STARCRAFT BUS warranty card at the time of delivery, please contact your dealer.

1. Who Warrants the product

The product, as described and limited here, is warranted by the manufacturer and installer of the body: GLAVAL BUS, Division of Forest River, Inc., hereinafter referred to as GLAVAL BUS, 2367 Century Drive, Goshen, IN; an Indiana Corporation; and is administered by the GLAVAL BUS Customer Service Dept., Goshen, Indiana 46528.

2. Who Is Covered

GLAVAL BUS, the warrantor, extends this limited warranty to the original owner of the vehicle during the WARRANTY PERIOD.

3. What Is Covered

GLAVAL BUS, your warrantor, extends the following limited warranty to you, which limited warranty covers your conversion only as to material defects in all materials and workmanship supplied by or performed by GLAVAL BUS.

4. Warranty Period

The GLAVAL BUS limited warranty is for a period of two (2) years from the date of first delivery or 75,000 miles for the, whichever occurs first, except for other coverages listed under “Other Warranties that may Apply” and items listed under “Exclusions and Limitations” and “Limits of the Warranty.”

5. Extended Warranty on Structural Items

Warrantor warrants to the original purchaser for a period of three (3) years from the date of first delivery or 75,000 miles, whichever comes first, that this produce shall be free of SUBSTANTIAL DEFECTS arising out of or relating to the structural portion of the product. THIS STRUCTURAL WARRANTY IS INTENDED TO COVER ONLY THE PERFORMANCE OF THE STEEL CAGE STRUCTURE OF THE BUS BODY .

Custom paint and/or tape application, if performed by STARCRAFT BUS, is warranted to be free of substantial defects in workmanship and materials provided by GLAVAL BUS for one (1) year (12 months) from date of original purchase.

6. Other Warranties That May Apply

GLAVAL BUS does not warrant the base vehicle itself. The vehicle engine, chassis, drive train, suspension system, battery, and other chassis components are covered by a separate warranty offered by the manufacturer of the vehicle and administered by the manufacturer’s authorized dealers. The tire manufacturer separately warrants tires. Examples of other manufacturer warranties, which may include the following, but not limited to:

- Electrical Components
- Air Conditioning and Heater(s)
- Wheelchair Restraints and Wheelchair Lifts

For a complete list of items and their respective warrantor, please contact Glaval Bus Customer Service Department.

7. Owner’s Responsibility

Proper maintenance and cleaning of the exterior and interior of the vehicle is the responsibility of the owner. See the owner’s manual for proper care instructions. Defects or damage as a result of improper care or maintenance are not covered by the warranty.

8. Exclusions and Limitations

Damage caused by abuse, misuse, neglect, failure to observe reasonable and required maintenance practices, acid rain, accidents, natural disasters, acts of war and normal wear and tear and facing of fabrics, carpeting and/or fiberglass are not covered. Light bulbs and fuses are not covered.

Damage or deterioration to the physical appearance of the unit if such damage is the result of normal use, wear and tear, or exposure to the elements.

Damages that may occur to the chassis, frame, other parts or components that occur due to overloading will not be covered and may invalidate portions of the GLAVAL BUS warranty.

Cosmetic or surface corrosion resulting from stone chips or scratches in paint are not covered.

GLAVAL BUS does not cover accessories covered by their own manufacturer's warranties. Those items listed in paragraph 6 above are not covered or warranted by GLAVAL BUS.

Replacement parts provided under terms of the warranty will whenever possible, match original equipment. When necessary, GLAVAL BUS will substitute parts of comparable function and value. Defective items may be replaced with new, remanufactured, reconditioned or repaired components.

Modifications, alterations or repairs performed by unauthorized personnel may invalidate portions of the STARCRAFT BUS warranty. In addition, USING THIS VEHICLE TO TOW ANOTHER VEHICLE IS PROHIBITED AND MAY VOID WARRANTY. Contact STARCRAFT BUS Customer Service before you make any changes.

9. Recovery Limitations

NO PERSON SHALL BE ENTITLED TO RECOVER FROM WARRANTOR FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES ARISING OUT OF OR RELATING TO ANY DEFECT IN THE PRODUCT. These limitations include, but are not limited to, loss of time; loss of use; loss of revenues, salaries or commissions; towing charges; bus fares; car rentals; gasoline expenses; telephone charges; inconvenience or other incidental damages.

10. How to get warranty service

To obtain warranty service, contact or visit the dealership where you originally purchased your vehicle or another warranty service facility designated by GLAVAL BUS. Have the dealership contact Glaval bus Customer Service Department for authorization to have a warranty claim submitted. If you or your dealer has moved, or if your dealer is no longer in business, contact GLAVAL BUS Customer Service Department (see address and telephone numbers below) for the name of a STARCRAFT BUS dealer nearest you. Your claim must be made within 30 days of the discovery of the defect. Based on the determination of GLAVAL BUS, and subject to the terms of the warranty, the warranty repair work will be authorized by GLAVAL BUS.

All warranty claims must be reported within the warranty period. Warranty personnel must authorize all warranty service prior to performance. Warranty service may be reported directly to the warrantor or to one of their authorized dealers. If warranty personnel approve warranty service, you must leave the unit at the appropriate warranty service location for a sufficient time to perform service.

11. Who Performs Warranty Service

The best place to obtain warranty service is at the dealership where you originally purchased your bus. If the dealership cannot perform the service work, they should call GLAVALBUS Customer Service Department for assistance (see number below). If you are unable to visit your original dealer, contact GLAVAL BUS Customer Service Department (address below) for the name and location of a GLAVAL BUS dealer near you.

12. Dispute Resolution

Should you be unable to resolve a disagreement with your dealer regarding your right to pursue warranty coverage for a needed repair, contact the GLAVAL BUS Customer Service Department (see address below). If a dispute about warranty service arises between GLAVAL BUS and you, the owner, the disagreement will be resolved in accordance with the customary procedures of the American Arbitration Association relating to commercial transactions, or the dispute will be submitted to a panel of three (3) arbitrators for decision. The panel will be made up of one member appointed by GLAVAL BUS, one member appointed by the complainant/owner, and one member from the arbitrators group mentioned above. Any and all legal remedies shall be available to the owner after pursuing this informal dispute resolution if a ruling is entered against GLAVAL BUS and GLAVAL BUS fails to abide by the ruling. The expenses of arbitration will be paid by the party against whom the arbitrator(s) rule.

13. Limits Of Warranty

This written statement of limited warranty represents the entire warranty authorized and offered by STARCRAFT BUS. There are no warranties or representations beyond those expressed in this written document. Any dealership, salesperson or agent cannot amend it. It expressly limits all warranties, including, but not limited to, by way of specification, both express and implied warranties, including warranties or merchantability and fitness for a particular purpose along with all other liabilities or obligations of STARCRAFT BUS.

FEDERAL COMPLIANCE

THE TERMS OF THE WARRANTOR'S UNDERTAKING EXPRESSED IN THIS LIMITED WARRANTY ARE DRAFTED TO COMPLY WITH THE MAGNUSEN MOSS WARRANTY LEGISLATION, P.L. 93-637 OF 1974, AND OTHER APPLICABLE LAW. ANY WARRANTY PROVISIONS PROMULGATED BY THE FEDERAL TRADE COMMISSION PURSUANT TO RULES OR ANY OTHER LAW RELATIVE THERETO ARE EXPRESSLY INCORPORATED HEREIN. TO THE EXTENT ANY PROVISIONS OF THIS LIMITED WARRANTY ARE INCONSISTENT WITH STATE LAWS, ONLY THOSE PARTS INCONSISTENT ARE VOID.

GLAVAL BUS
CUSTOMER SERVICE DEPT.
2367 Century Drive
Goshen, IN 46528
Phone: 800.348.7440
Fax: 574.642.4853

FOREST RIVER BUS

Component Warranty Contact Information

It is the customer's responsibility to register products with the respective vendors. Failure to do so may result in denial and/or significant delays in warranty coverage or consideration. **For full warranty details, refer to your new bus packet which has been provided.**

PRO AIR (HEATERS)

Victoria Frederick: vfrederick@proairllc.com
Charles McMillan: charlesm@proairllc.com (copy Charles on emails sent to Victoria)

Phone: 800-338-8544

Warranty: 2 years / unlimited mileage

FREEDMAN SEATING

Terry Gogins: terry.gogins@freedmanseating.com • 800-443-4540

Warranty:
Metal components – 5 years
Plastic components – 3 years
Moving components – 3 years
Gas shock components – 1 year

Upholstered components (foam): 3 years
Cover warranty is for defects in the material or sewing and is limited to replacement covers.

A&M SYSTEMS (ENTRY DOORS)

Nicole Luken: nluken@anmsystems.com

Phone: 574-522-5000

Warranty: 1 year / unlimited mileage

RC TRONICS

Will Vanett: wvanett@rctronics.com

Phone: 866-457-7790

Warranty: All Plug-N-Play Control Systems – 3 years / 100,000 miles with labor coverage
3 additional years with parts only, all other RCT parts and controls are for 1 year

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SMI

Warranty: warranty@smiglobal.net
Corbin West: corbin.west@smiglobal.net
Vikki Queen: vikki.queen@smiglobal.net

Phone: 704-247-9300

Warranty:
Stop and crossing arms – 2 years
Roof hatches – 1 year
All other product – 1 year

ASA ELECTRONICS

Support: techsupport@asaelectronics.com

Phone: 800-688-3135

Warranty: 2 years / unlimited mileage

CHILD CHECKMATE

Danek Fill: danek@childcheckmate.com

Phone: 613-835-2489

Warranty: 5 years

Q STRAINT

Customer Service: customersatisfaction@qstraint.com

Phone: 800-987-9987

Warranty: 3 years

MORRYDE

Jessica Arseneau: Jessica.Arseneau@morryde.com

Warranty: 3 year / 36,000 miles

INTERMOTIVE

Debbie Cabrera: Dcabrera@intermotive.net

Phone: 530-823-1048

Warranty: 2 years

TRANSAIR

Jeff Kochenour: jkochenour@transairmfg.com

Phone: 800-673-2446

Warranty:
2 year / unlimited mileage OR 3 year / 36,000 miles for SCHOOL BUS / MFSAB
30 month / unlimited mileage – COMMERCIAL BUS

ACC CLIMATE CONTROL

Shaun Larson: Shaun.Larson@spheros.us

Phone: 574-264-2190

Warranty: 2 year / unlimited mileage OR 3 year 75,000 Miles (1 year driver ventilation fan)

MCC MOBILE CLIMATE CONTROL

Robert Krajcsik: Robert.Krajcsik@mcc-hvac.com
Scott Matthews: Scott.Matthews@mcc-hvac.com

Phone: 717-767-3341

Warranty: 2 year

SUMMARY OF STANDARD WARRANTIES

Forrest River/Glaval
Ford Chassis

Warranty	Miles	Years
Body Structure	100,000	5
Chassis	36,000	3
Engine	60,000	5
Transmission	60,000	5
Air conditioner	Unlimited	3
Lift/Ramp	Unlimited	2
Water Leak Warranty	Unlimited	3
Other Options	36,000	3

The following information is submitted for all Glaval Bus products proposed on METROPOLITAN TRANSIT AUTHORITY IFB 4018000162 as supporting documentation of the structural soundness and impact resistance of the bodies manufactured. All vehicles are built using virtually the same materials with some minor differences in the height and width of cross members due to entry floor heights and/or body width variations.

A representative set of construction prints provided by engineering supplements this verbal accounting of our materials and assembly specifications.

If, in the reviewing of these written technical specifications and engineering frame prints submitted any questions arise, please contact us immediately for any clarification or help in interpretation and understanding.

3.0 Body Construction – General Frame Construction

Manufactured from all galvanized steel products, the floor, roof, side walls, rear wall, driver halo assembly and entry door assembly are all wire welded (MIG) together to form an integral galvanized steel frame that is mounted with specified hardware to the rubber body mount points (pucks) supplied by the chassis manufacturer. Once joined to the chassis, the bus finishing process begins.

3.0.1 Floor frame construction and assembly –

3.0.1.1 Cross Members -- The floor cross members form the base structural support for the rest of the frame components. Our cross members are constructed of 14 gauge galvanized steel, formed to a capital "C" shape. Cross members over the fuel tank are made to provide the clearance needed to conform with FMVSS301, and include formed internal reinforcements welded in place for additional strength. All additional longitudinal and latitudinal structure is flush welded in place to form a one piece floor upon completion.

3.0.1.2 Galvanized steel "Hat Posts" – 1"x1"x4" run the length of the floor between cross members and are welded into place. This extremely strong form is used to weld our HSLA steel seat track in place.

3.0.1.3 Galvanized steel C Channel – 1"x1.5" C channel is welded in between cross members the full length of the floor in 5 places. Coupled with the Hat Posts this provides a one-piece strong "ladder" type frame for the flooring.

3.0.1.4 Seat Track – 12 gauge roll formed high strength/low alloy steel is wire welded in place for seat mounting down each side of the bus, with lengths predicated on the floor plan chosen. This is yet another stiffener in our extensive construction process.

3.0.1.5 Wheel Wells -- Constructed of 14 gauge galvanized steel, wheel wells are also welded in during the floor construction process. All seams in the wheel well are welded to create a one piece water resistant wheel housing structure. The wheel wells also provide additional strength to the body assembly, when welded in place.

3.0.1.6 Structural Galvanized steel Angle – 1/8" thick 1.5" x 2.5" structural galvanized steel angle is used the full perimeter length of each floor assembly, welded to the ends of all floor cross members. This provides not only a flat plane for joining the sidewall assembly, but also ties all cross members together and provides additional side impact resistance.

3.0.1.7 Additional structure – When adding vertical stanchions, wheel chair lifts and/or tie down options, additional structure is welded into the floor at locations specified by our engineering department on CAD drawings.

3.0.2 Sidewall Construction –

3.0.2.1 Sidewall vertical member – The heart of our sidewall is the vertical structure, a roll formed 18 gauge galvanized steel 1.5" x 2" tube that provides strength and rigidity. The vertical member is installed in full lengths and in shorter sections below window frames. Additional vertical structure is used at both ends of the sidewall enabling the structure to withstand the forces applied by the vehicle when in motion.

3.0.2.2 Galvanized steel Tubing – 1.5"x1" lower and 1.5"x3" upper 16 gauge galvanized steel tubing is welded in horizontally between vertical members to frame in window openings. This adds front to rear reinforcement as well.

3.0.2.3 Seat Track – 12 gauge high strength/low alloy roll formed galvanized steel track is welded down each sidewall below the window frame. While serving as a seat attaching device, it adds excellent structure to the sidewall and also adds excellent side impact resistance.

3.0.2.4 Wheelchair Options – Add another layer of metal. Depending on track locations, another structure of 11 gauge thick galvanized steel is welded in place between each vertical member for attaching a shoulder belt mount. Also, additional structure is added to accommodate wheelchair door frames – either 1.5"x1" or 1.5"x2" 16 gauge wall glavanized steel tubing..

3.0.2.5 Full length glavanized steel tubing – 1.5"x1" 16 gauge galvanized steel tubing is stitch welded to the sidewall bottom and top at each vertical member for attaching to the floor and roof sections, respectively.

3.0.3 Rear Wall Construction –

3.0.3.1 Rear wall vertical member – The vertical sidewall 1.5"x 2" galvanized steel tube is also used in the rear wall assembly. Full length structure is used at varying places,

depending on choice of rear window, or rear door. Shorter cut pieces are used above windows and doors. Additional side windows used with the rear door also change the configuration.

3.0.3.2 Galvanized steel Tubing – 1.5”x1” 16 gauge aluminized steel tubing is welded horizontally between vertical members to provide a window frame in the standard product, and used as an upper door frame in the optional rear assembly.

3.0.3.3 Full length galvanized steel tubing – 1.5”x1” 16 gauge galvanized steel tubing is stitch welded to the rear wall top and bottom as in the sidewall

assembly. **3.0.4 Roof Construction –**

3.0.4.1 Roof Bows – Radius formed one-piece 16 gauge galvanized steel roof bows formed as a modified hat post design with eight bends for exceptional strength and located on 16” centers (the closest in the industry), including 4 bends in the web that allows for the roof structure to be capable of taking severe loads. They are then capped with top flat pieces from flange to flange to provide abundant surface area for securing the exterior roof material.

3.0.4.2 Galvanized steel Tubing – 1.5”x1” 16 gauge aluminized steel tubing is welded in horizontally to frame all lower window openings and 1.5” x 3” 16 gauge galvanized steel tubing to all upper window openings as required. A full perimeter is also welded on to mate the roof to the sidewall and rear wall, with short vertical pieces providing support on the front and rear ends. The 3” wide galvanized steel tube supplies a structural mounting surface for shoulder belt attachment and has been pull tested to federal standards.

3.0.5 Driver Compartment Overhead Halo –

3.0.5.1 Galvanized steel Tubing – 1”x1” 16 gauge galvanized steel tubing is cut and jig welded into an integrated one piece structure spanning from the front roof bow of the body to the newly cut roof line of the cab. Also created during the structure manufacture is the housing for mounting the electronic circuit board.

3.0.5.2 11 Gauge Galvanized steel – formed to make brackets used to mount to the chassis roof.

3.0.6 False Floor (Cab to body transition) –

3.0.6.1 Galvanized steel Tubing – 2” x 2” 16 gauge galvanized steel tubing is welded together forming a flat body floor transition from the step area back to the actual body area. An overhang on the curbside provides a secure attach point frontally for the entry door frame added later.

3.0.6.2 Structural galvanized steel angle – 11 gauge 1.5”x1.5” structural angle is added in short lengths five places to provide attachment points to the chassis floor.

3.0.7 Interior Vertical Transition Frames –

3.0.7.1 Galvanized steel Tubing – 1”x1” 16 gauge galvanized steel tubing is used vertically and a ladder type assembly is made welding the 1x 1 tube to .75”x.75” 11 gauge galvanized steel tube that is used horizontally in the assemblies. These pieces transition from the body fronts on each side to the driver halo side assembly and the entry door frame assembly on the curbside.

3.0.8 Entry Door & Step Assembly Frame –

3.0.8.1 Galvanized steel Tubing – 1”x1” 16 gauge and .75”x.75” 11 gauge galvanized steel tube is cut to length and welded together in a ladder type construction forming a rigid frame for attaching the entry door/step assembly.

3.0.9 Entry Door/Step Assembly –

3.0.9.1 11 Gauge Galvanized steel – The step riser/tread piece is manufactured from one-piece 11 gauge galvanized steel and uses 90º bends at all risers and treads. The bottom tread also adds an additional 90° bend for additional strength and safety. Upper and lower side pieces are then attached and an 11 gauge flat plate with holes is used to bridge the lower and upper side pieces, then is stitch welded and plug welded to form a strong one piece assembly prior to inserting and welding to the entry step framing.

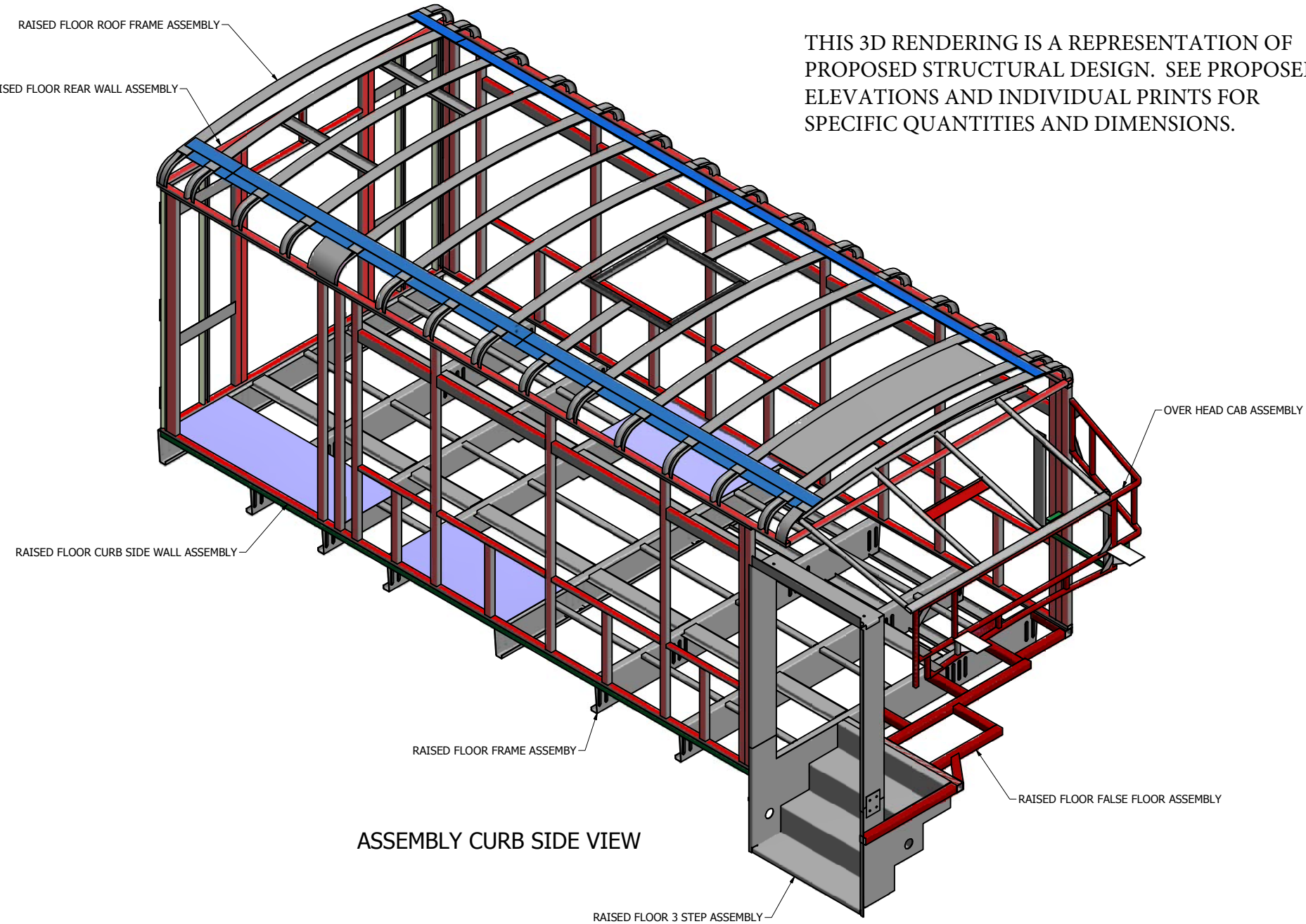
APPLICATION OF EXTERIOR SIDEWALL MATERIAL

GALVANIZED STEEL SIDEWALLS OR OPTIONAL FIBERGLASS/FRP/COMPOSITE SIDEWALLS

The exterior is .024” galvanized steel pre-painted white with an underlayment of 5/32” luan.
The interior is 5/32” luan covered with a light gray FRP or padded vinyl.
The foam filled galvanized steel cage is placed in the center and all layers are adhered using a cross linked polyurethane hot melt adhesive. The entire assembly is then laminated to assure adhesion.

Composite FRP exterior sidewall panels are installed using the same method.

Should any further questions arise, please contact your Glaval Bus representative.



THIS 3D RENDERING IS A REPRESENTATION OF PROPOSED STRUCTURAL DESIGN. SEE PROPOSED ELEVATIONS AND INDIVIDUAL PRINTS FOR SPECIFIC QUANTITIES AND DIMENSIONS.

ASSEMBLY CURB SIDE VIEW

*****ALL MATERIALS GALVANIZED*****

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
BUS	A	REPLACED WALL BOWS WITH TUBE	6/13/2018	TAS

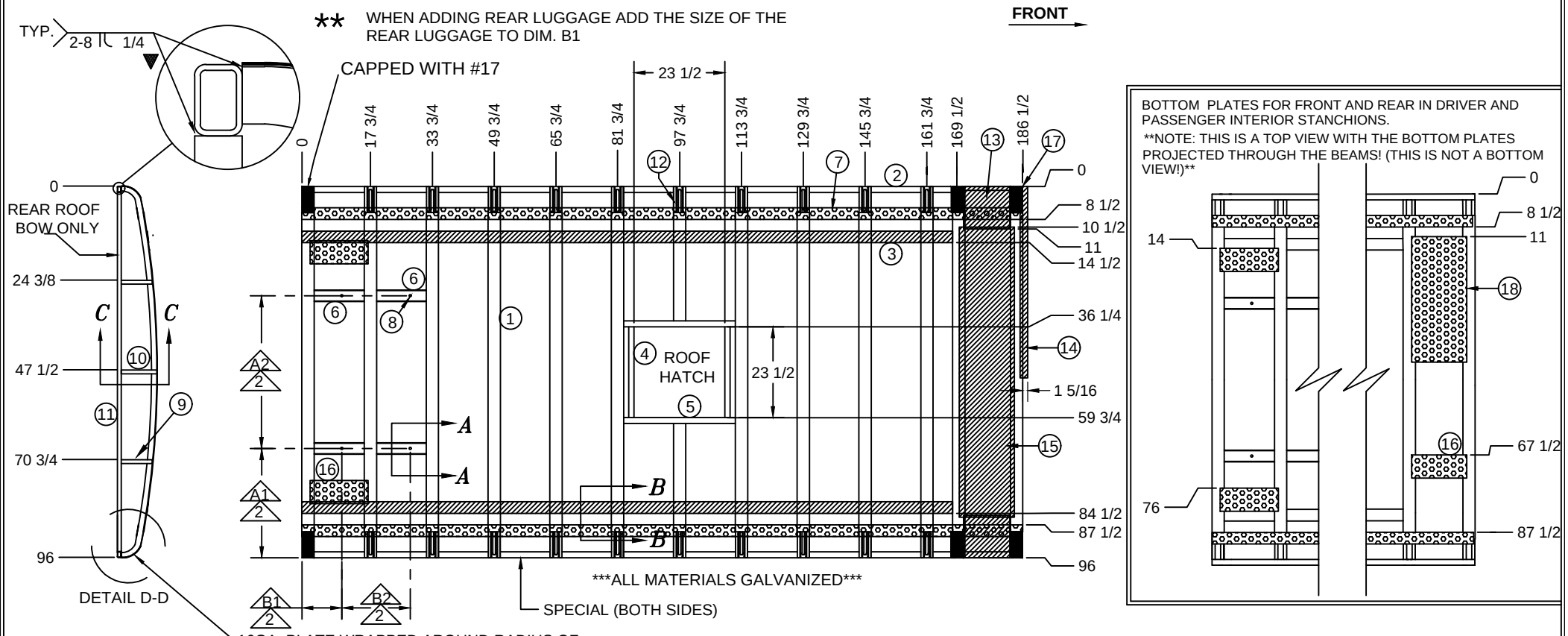
Glaval Bus
A Division Of Forest River, Inc.

DFTSN: TAS	TITLE	Ford Step Entry Raised Floor Assembly	
DATE: 08/27/13	DWG NO	84156B-2	SHEET 1 OF 1

▼ CRITICAL CONTROL ITEM

USAGE: 2011 ALLSTAR, FORD MODEL 24

** WHEN ADDING REAR LUGGAGE ADD THE SIZE OF THE REAR LUGGAGE TO DIM. B1



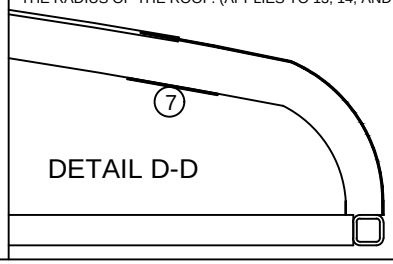
BOTTOM PLATES FOR FRONT AND REAR IN DRIVER AND PASSENGER INTERIOR STANCHIONS.

NOTE: THIS IS A TOP VIEW WITH THE BOTTOM PLATES PROJECTED THROUGH THE BEAMS! (THIS IS NOT A BOTTOM VIEW!)

NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.
2- A/C BOLT PATTREN MAY VERY SEE SALES ORDER.
3- BEFORE CUT ROOF HATCH SEE SALES ORDER.
4- SCREW LOCATION AT SEAMS AND EDGES 8" ON CENTER ALL OTHER LOCATION 16" ON CENTER.
5- SEALANT USAGE: 1/4" MIMIMUM 3/8"MAXIMUM BEAD ON ALL ROOF FRAME TO LUAN SURFACES.

SHADED AREA SHOWS 16GA. PLATE FORMED AROUND THE RADIUS OF THE ROOF. (APPLIES TO 13, 14, AND 17)**



- ADDITIONAL CAP
- PLATE WELDED TO TOP OF ROOF BOWS
- PLATE WELDED TO BOTTOM OF ROOF BOWS

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
5	2	70009047	"C" CHANNEL: 16ga. x 1-3/8" x 1-3/8" x 30-1/2" Lg.
4	2	70009047	"C" CHANNEL: 16ga. x 1-3/8" x 1-3/8" x 24-1/4" Lg.
3	2		SHEET STEEL: 16ga. x 3" x 168-1/2" Lg.
2	2		TUBE: 16ga. x 1" x 1.5" x 186-1/2" Lg. A-513
1	12	02062357	ROOF BOW W/CAP 16ga. x 3-3/16 x 96" Lg.

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
20	0		PLATE: 16ga. x 10" x 16" Lg.
19	0		SHEET STEEL: 16ga. x 3" x 77" Lg.
18	1		SHEET STEEL: 16ga. x 14-1/4" x 32-1/2" Lg.
17	6		PLATE: 16ga. x 1-1/2" x 9" Lg.
16	3		SHEET STEEL: 16ga. x 6" x 15" Lg.
15	1		PLATE: 16ga. x 14-1/4" x 75" Lg.
14	1		SHEET STEEL: 16ga. x 2" x 52-1/2" Lg.
13	2		SHEET STEEL: 16ga. x 12" x 15" Lg.
12	2	02062357	ROOF BOW W/CAP 16ga. x 3-3/16 x 35-1/4" Lg.
11	1		TUBE: 16ga. x 1" x 1" x 93" Lg. A-513
10	1		TUBE: 16ga. x 1" x 1" x 8-1/2" Lg. A-513
9	2		TUBE: 16ga. x 1" x 1" x 8" Lg. A-513
8	4		BOLT: 3/8-16 x 3" Lg. HEX HEAD
7	2		SHEET STEEL: 16ga. x 3" x 186-1/2" Lg.
6	4	70009046	"C" CHANNEL: 16ga. x 1" x 3-1/2" x 14-1/2" Lg.

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

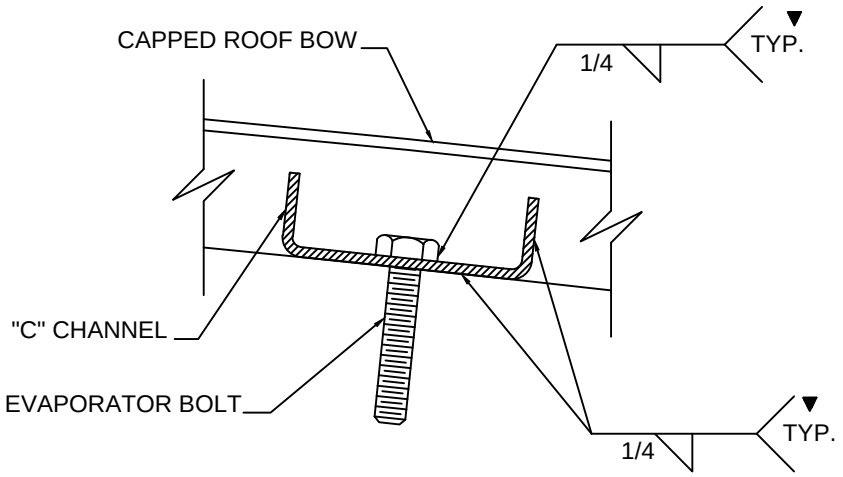
TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

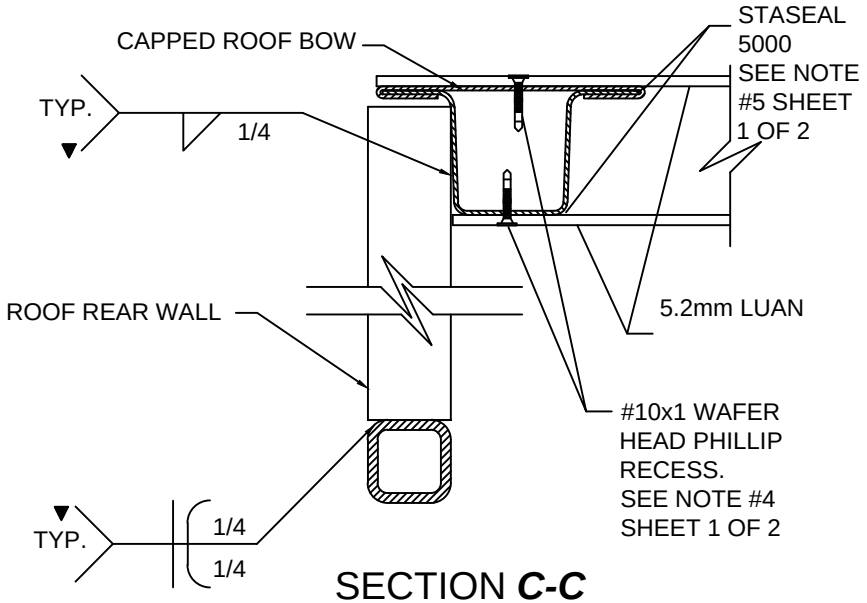
Glaval Bus *a division of Forest River, Inc.*

DATE: 06/11/18
NAME: MKLINE
TITLE: 158" WHEEL BASE MODEL 24 ROOF FRAME, STD. ROOF, SINGLE HATCH
DWG. No. 32-13-0017-18

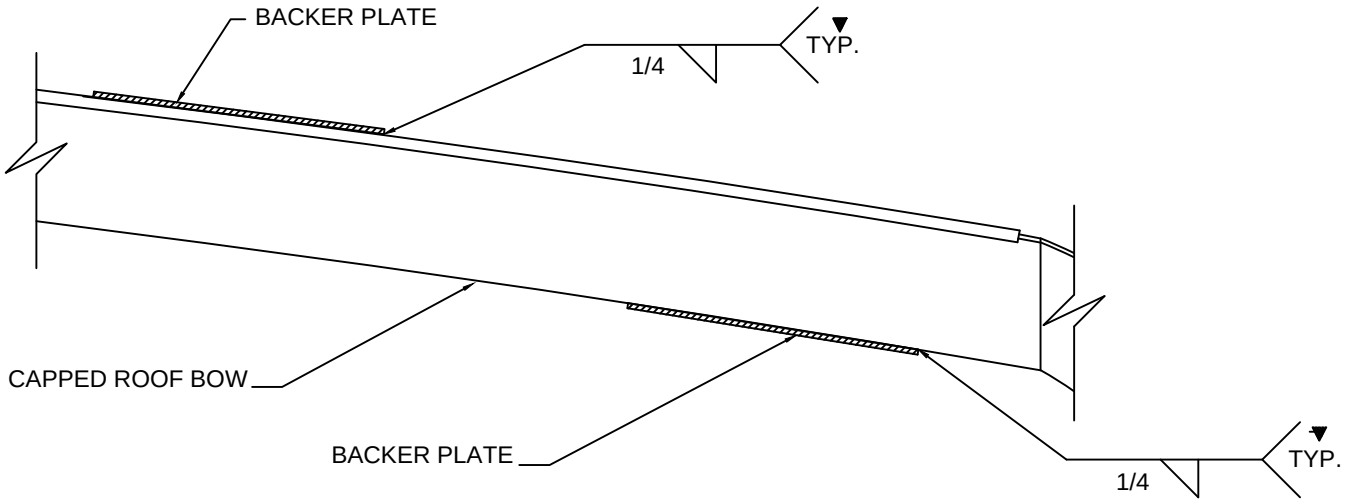
▼ CRITICAL CONTROL ITEM



SECTION ***A-A***



SECTION ***C-C***



SECTION ***B-B***

T/A-71 NEW STYLE	33-5/8	30	10	12-1/4
ACC 23022 SERIES	38	20	10	14-3/4
ACC 23023 SERIES	33-5/8	28-3/4	10	14-3/4
T/A-77	18-1/4	59-1/2	10	10-3/8
T/A-73	28-1/4	39-1/2	10	9-1/2
T/A-71 OLD STYLE	33-5/8	28-3/4	10	12-1/4
T/A-70	36-3/4	22-1/2	10	11-5/8
T/A-30	31	34	10	9-1/2
EM-14 & RE-29	30-3/4	34-1/2	10	9-1/2
EM-6 & RE-10	36	24	10	9-1/2
EM-3 & RE-30	28-1/4	39-1/2	10	16
RE-15 & RE-20	28-1/4	39-1/2	10	9-1/2
EM-1 & EM-2	28-1/4	39-1/2	10	9-1/2
EM-7 GEN 5	36-1/8	23-3/4	10	9-1/2
EM-2 GEN 5	32-3/8	31-1/16	10	9-1/2
EM-1 GEN 5	28-3/16	39-5/8	10	9-1/2
EVAPORATOR MODEL	A-1	A-2	B-1	B-2

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

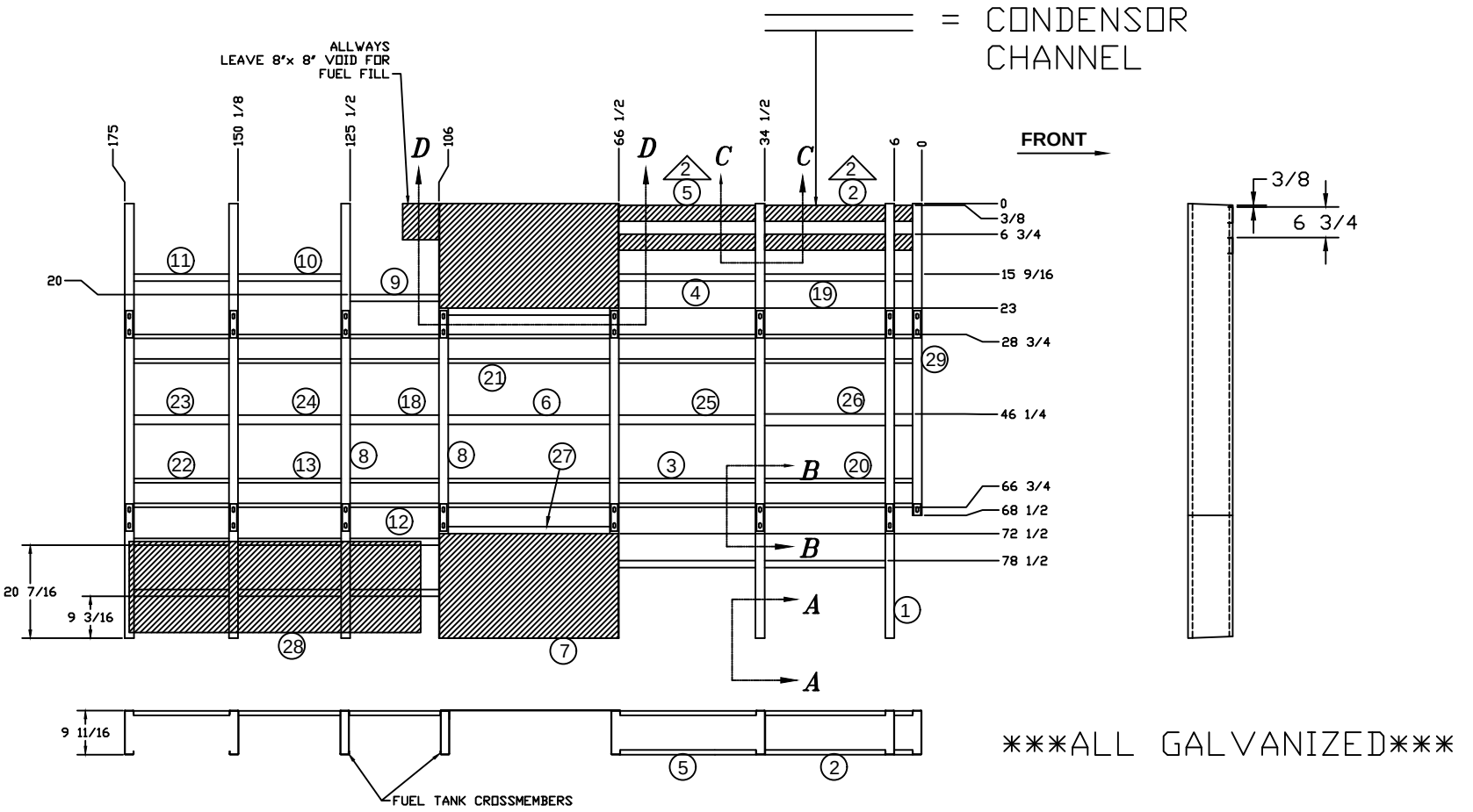
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus *a division of Forest River, Inc.*

DATE: 06/11/18
NAME: MKLINE
TITLE: 158" WHEEL BASE MODEL 24 ROOF FRAME, DETAILS SINGLE HATCH
DWG. No. 32-13-0017-18

▼ CRITICAL CONTROL ITEM

USAGE: 2011, FORD 158" WHEEL BASE, MODEL 24, 42" ENTRYWAY



NOTES:

1- DRAWING VIEWED FROM INTERIOR SIDE OF UNIT.

2 2- LOCATION OF A/C BRACKETS: ONE MOUNT FLUSH WITH OUTSIDE EDGE OF CROSSMEMBER. THE OTHER MOUNTS 14-3/4" FROM OUTSIDE EDGE OF CROSSMEMBER.

3- SEE SHEET 2 OF 2 FOR DETAILS, TORQUE SPECIFICATIONS, SECTION VIEWS AND CUT LIST.

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
7	2	71002066	SHEET STEEL: 11ga. x 24" x 39-1/4" Lg. HRS
6	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 35-5/8" Lg.
5	2	70009046	"C" CHANNEL: 12ga. x 1" x 3-1/2" x 30" Lg.
4	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 30" Lg.
3	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 30" Lg. A-513
2	2		"C" CHANNEL: 12ga. x 1" x 3-1/2" x 26-1/2" Lg.
1	5	71009018	14ga. x 2 x 9-11/16 x 95-1/2 CROSSMEMBER A-365

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

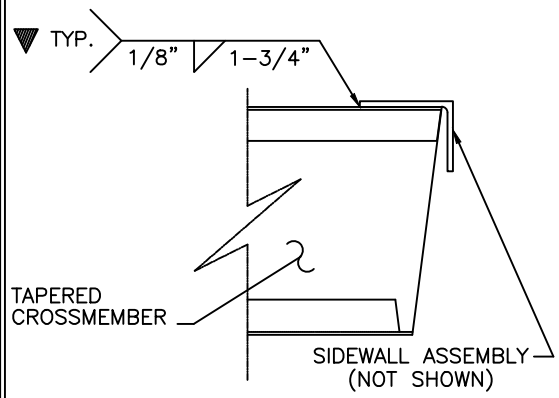
Glaval Bus a division of Forest River, Inc.

DATE 6/14/18 | TITLE: 158" WB MODEL 24 FLOOR FRAME, RAISED FLOOR

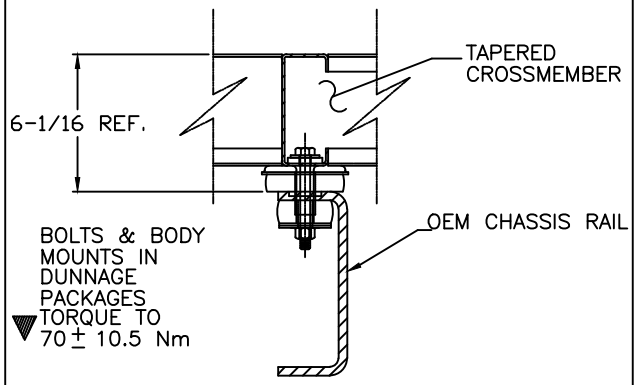
NAME: MKLINE

DWG. No. 32-13-0031-18 SPECIAL

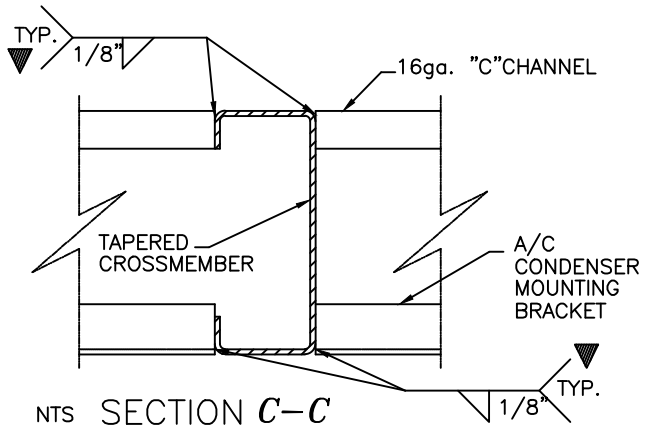
▼ CRITICAL CONTROL ITEM



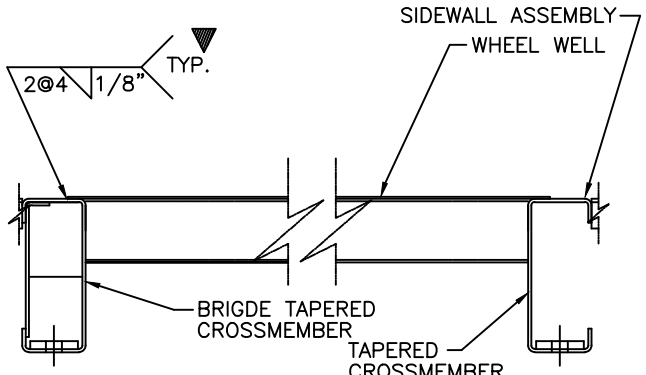
NTS SECTION ***A–A***



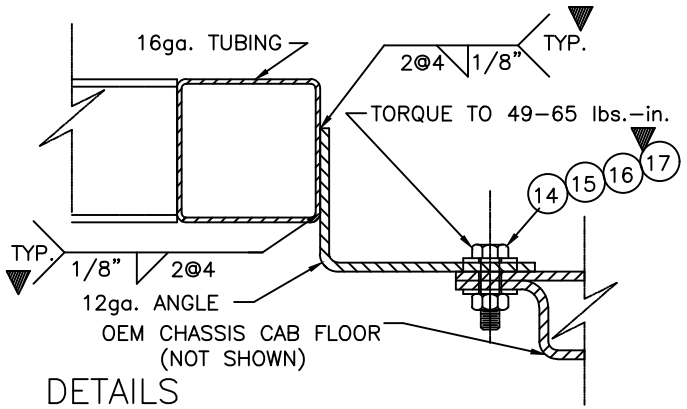
NTS SECTION ***B–B***



NTS SECTION ***C–C***



NTS SECTION ***D–D***



NTS DETAILS

ALL GALVANIZED			
29	1		14ga. x 2 x 9-11/16 x 68-1/2 CROSSMEMBER A-365
28	2		PLATE: 11ga. 20" x 64" Lg.
27	2	71002028	TUBE: 16ga. x 1-1/2" x 1-1/2" x 35-5/8" Lg. A-513
26	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 26-1/2" Lg.
25	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 30" Lg.
24	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 22-3/8" Lg.
23	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 20-7/8" Lg.
22	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 20-7/8" Lg. A-513
21	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 35-5/8" Lg. A-513
20	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 26-1/2" Lg. A-513
19	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 26-1/2" Lg.
18	1		"U" CHANNEL: 16ga. 1" x 2" x 1" x 19-3/4" Lg.
17	7	80052007	NUT, HEX HEAD 3/8-16 UNC GRADE 5 ZINC
16	7	80042015	WASHER MED LOCK 3/8 ZINC
15	14	80042007	WASHER 3/8 USS ZINC
14	7	80112051	BOLT, HEX HEAD 3/8-16 X 1 UNC GRADE 5 ZINC
13	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 22-3/8" Lg. A-513
12	2	32-32-0060-11	HAT CHANNEL: 16ga. x 1" x 6-5/16" x 19-3/4" Lg. A-513
11	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 20-7/8" Lg.
10	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 22-3/8" Lg.
9	2		"C" CHANNEL: 16ga. 1" x 1-1/2" x 1" x 19-3/4" Lg.
8	2	70009055	14ga. x 2 x 4-13/16 x 95-1/2 bridge crossmember
REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

DATE 6/14/18 | TITLE: 158" WB MODEL 24 FLOOR FRAME, RAISED FLOOR

NAME: MKLINE | DWG. No. 32-13-0031-18 SPECIAL

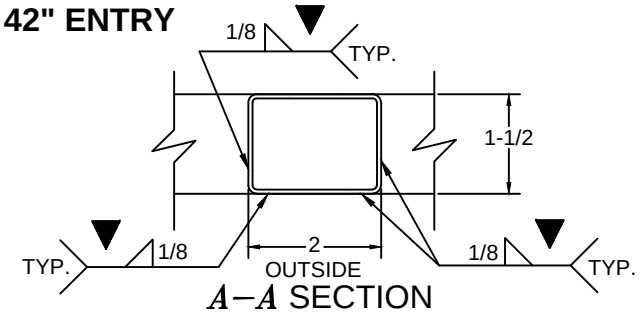
▼ CRITICAL CONTROL ITEM

USAGE: FORD 158"WB/MODEL 24, 42" ENTRY

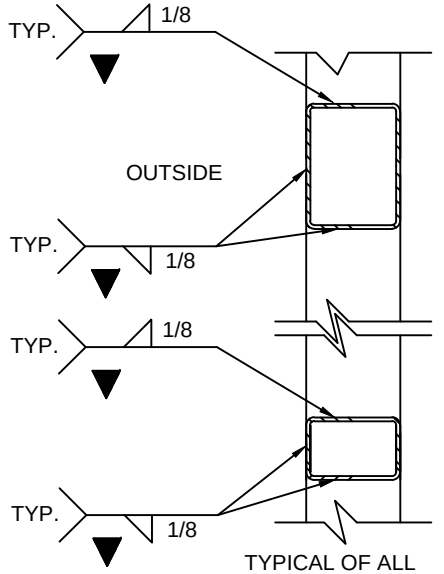
NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2- ANGLE TO BE WELDED FLUSH WITH OUTSIDE EDGE OF WALL.

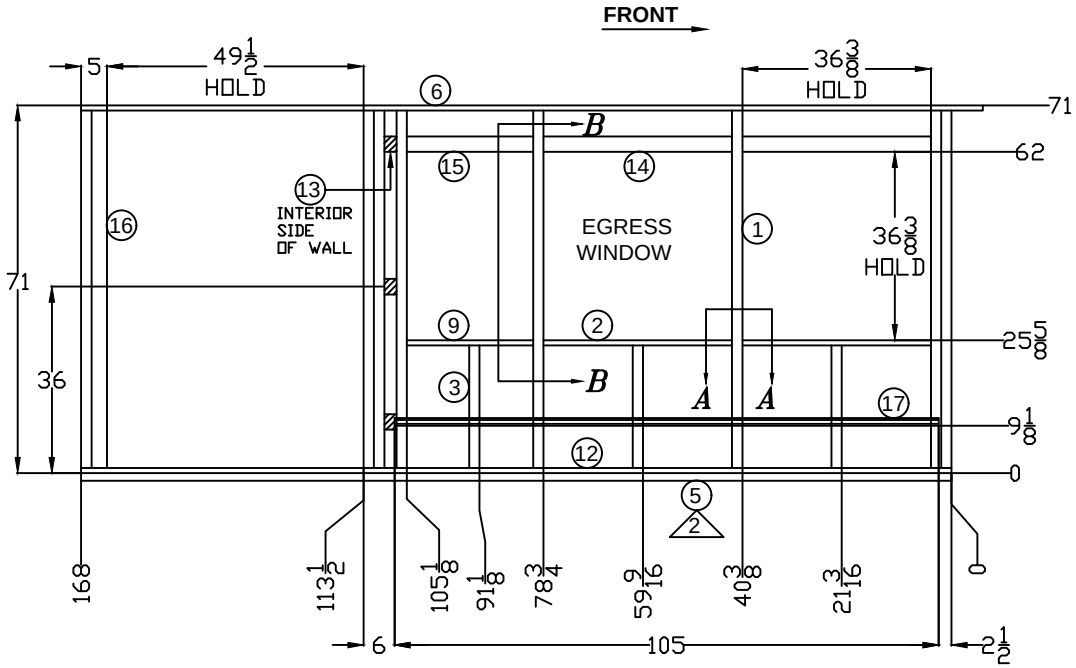


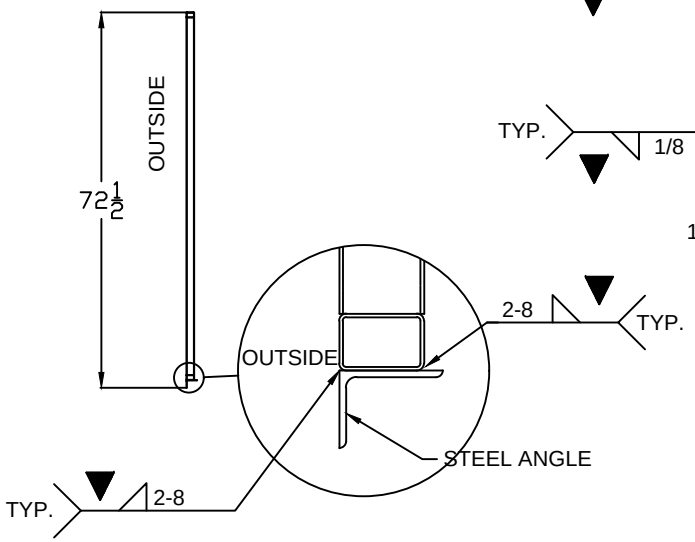
$A-A$ SECTION



TYPICAL OF ALL OPENINGS WHERE 1-1/2" x 1" TUBING USED.

SECTION $B-B$





ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
8	0		FRAME, SIDEWALL WHEEL WELL FORD
7	0		TUBE: 18ga. x 1-1/2" x 2" x 66-13/16"Lg. A-513
6	1		TUBE: 16ga. x 1-1/2" x 1" x 174"Lg. A-513
5	1		ANGLE: 11ga. x 1-1/2" x 2" x 168"Lg. A-513
4	0		TUBE: 16ga. x 1-1/2" x 1" x 46-3/4"Lg. A-513
3	4		TUBE: 18ga. x 1-1/2" x 2" x 23-5/8"Lg. A-513
2	2		TUBE: 16ga. x 1-1/2" x 1" x 36-3/8"Lg. A-513
1	8		TUBE: 18ga. x 1-1/2" x 2" x 69"Lg. A-513

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
17	1		SEAT TRACK: 105-1/2"Lg.
16	1		TUBE: 18ga. x 1-1/2" x 3" x 69"Lg. A-513
15	1		TUBE: 16ga. x 1-1/2" x 3" x 24-3/8"Lg. A-513
14	2		TUBE: 16ga. x 1-1/2" x 3" x 36-3/8"Lg. A-513
13	3		STRAP: 11ga. x 3" x 2-3/8"Lg. A-513
12	1		TUBE: 16ga. x 1-1/2" x 1" x 168"Lg. A-513
11	0		ANGLE: 11ga. x 1-1/2" x 2" x 65-3/4"Lg. A-513
10	0		TUBE: 16ga. x 1-1/2" x 1" x 64-3/4"Lg. A-513
9	1		TUBE: 16ga. x 1-1/2" x 1" x 24-3/8"Lg. A-513

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

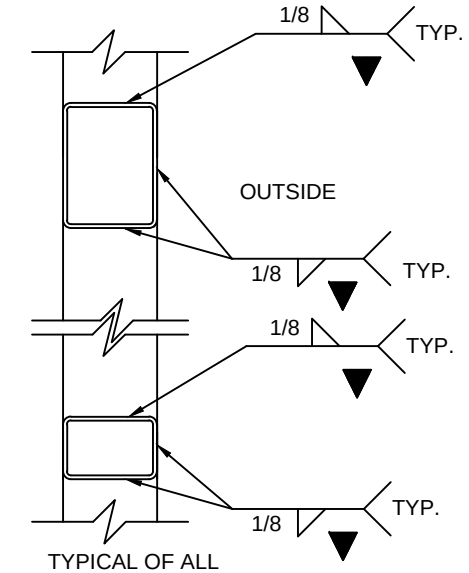
DATE: 6/14/18 NAME: MKLINE

TITLE: 158" WB MODEL 24, 42" ENTRY SIDEWALL, R. LIFT, RAISED FLOOR

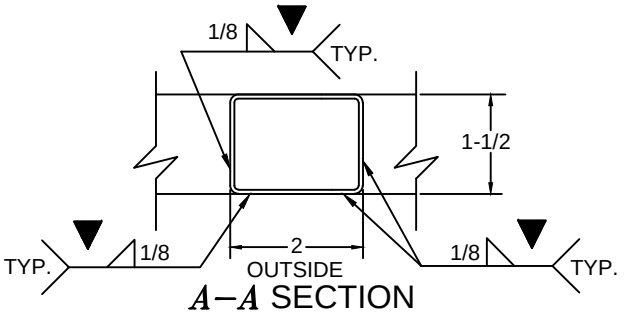
DWG. No. 32-13-0030-18 SPECIAL 42 ENTRY

▼ CRITICAL CONTROL ITEM

USAGE: FORD 158"WB/MODEL 24



TYPICAL OF ALL OPENINGS WHERE 1-1/2" x 1" TUBING USED.

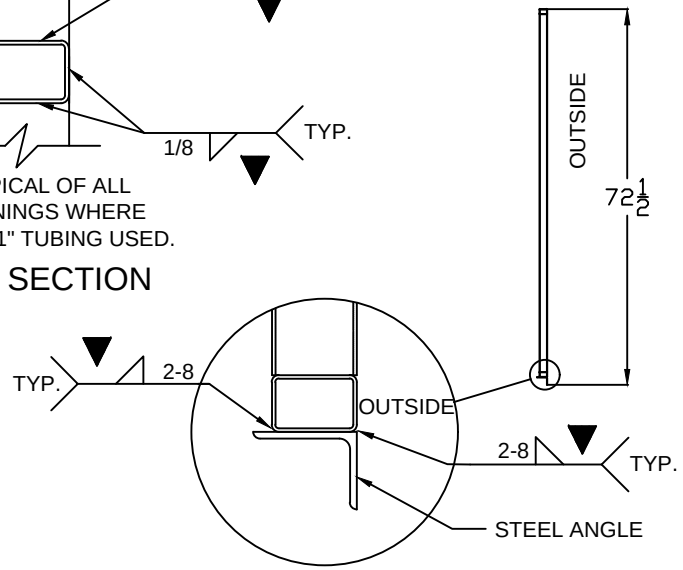


$A-A$ SECTION

NOTES:

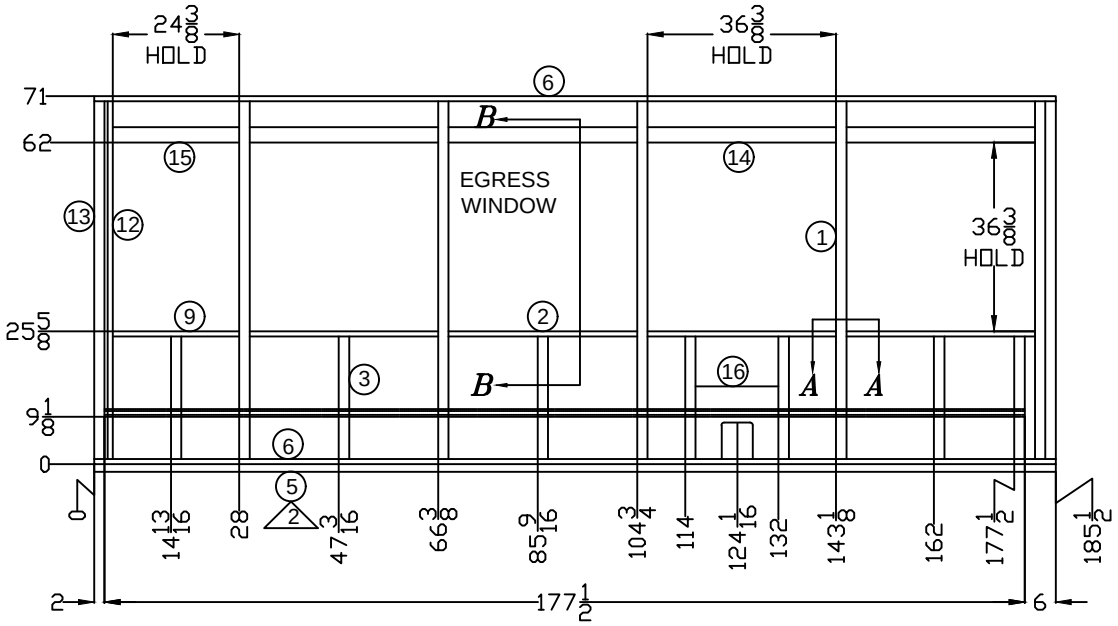
1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2- ANGLE TO BE WELDED FLUSH WITH OUTSIDE EDGE OF WALL.



$B-B$ SECTION

FRONT



ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
8	0		FRAME, SIDEWALL WHEEL WELL FORD
7	0		TUBE: 18ga. x 1-1/2" x 2" x 70-7/8"Lg. A-513
6	2		TUBE: 16ga. x 1-1/2" x 1" x 185-1/2"Lg. A-513
5	1		ANGLE: 11ga. x 1-1/2" x 2" x 185-1/2"Lg. A-513
4	0		TUBE: 16ga. x 1-1/2" x 1" x 79-9/16"Lg. A-513
3	7		TUBE: 18ga. x 1-1/2" x 2" x 23-5/8"Lg. A-513
2	4		TUBE: 16ga. x 1-1/2" x 1" x 36-3/8"Lg. A-513
1	5		TUBE: 18ga. x 1-1/2" x 2" x 69"Lg. A-513

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
17	1		SEAT TRACK: 177-1/2"Lg.
16	1		FUEL FILL BACKER BOARD
15	1		TUBE: 16ga. x 1-1/2" x 3" x 24-3/8"Lg. A-513
14	4		TUBE: 16ga. x 1-1/2" x 3" x 36-3/8"Lg. A-513
13	2		TUBE: 16ga. x 1-1/2" x 2" x 69"Lg. A-513
12	1		TUBE: 16ga. x 1-1/2" x 1" x 69"Lg. A-513
11	0		ANGLE: 11ga. x 1-1/2" x 2" x 70-3/16"Lg. A-513
10	0		TUBE: 16ga. x 1-1/2" x 1" x 70-3/16"Lg. A-513
9	1		TUBE: 16ga. x 1-1/2" x 1" x 24-3/8"Lg. A-513

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

Glaval Bus — a division of Forest River, Inc.

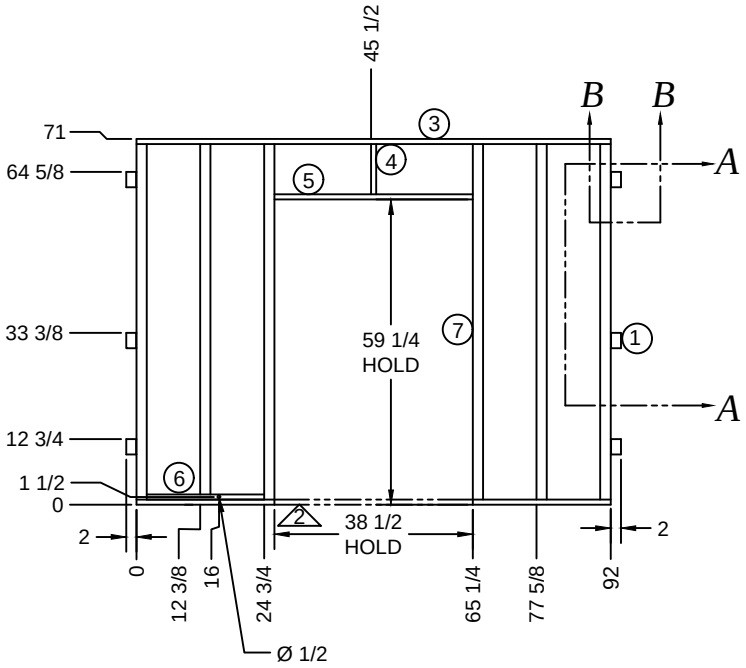
DATE: 6/13/18 NAME: MKLINE

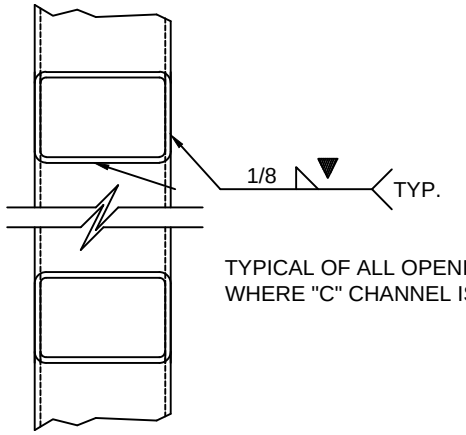
TITLE: 158" WB MODEL 24, DR. SIDEWALL, ALL PASS, RAISED FLOOR

DWG. No. 32-13-0002-10

CRITICAL CONTROL ITEM

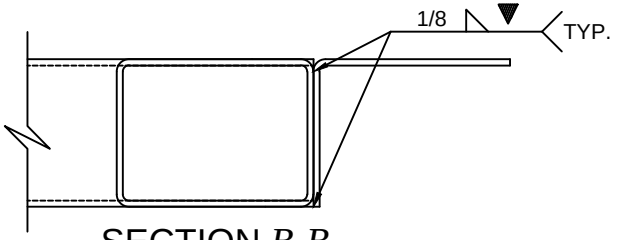
USAGE: Raised Floor w/ Rear Door, SPECIAL 1-1/2" THICK WALL





TYPICAL OF ALL OPENINGS
WHERE "C" CHANNEL IS USED

SECTION *A-A*



SECTION *B-B*

ALL MATERIALS GALVANIZED

REF. No.	QTY.	PART No.	MATERIAL DESCRIPTION
7	6		TUBE: 16ga. x 1-1/2" x 2" x 69"Lg. A-513
6	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 10-3/8"Lg. A-513
5	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 38-1/2"Lg. A-513
4	1	02071055	TUBE: 16ga. x 1-1/2" x 1" x 9-3/4"Lg. A-513
3	2	02071055	TUBE: 16ga. x 1-1/2" x 1" x 92"Lg. A-513
2	0		
1	6		ANGLE: 16ga. x 1" x 2" x 6"Lg. A-513

NOTES:

1- DRAWING VIEWED FROM EXTERIOR SIDE OF UNIT.

2 2- REMOVE STEEL TUBE IN DOOR AREA AFTER WALL MOUNT TO FLOOR BUT BEFORE INSTALLING DOOR JAM ASSEMBLY.

Glaval Bus *a division of Forest River, Inc.*

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED
± .00 ± .030
± .000 ± .015
± .0000 ± .005

DATE: 06/14/18
DFTSN: MKLINE
CHKR:
APRVD:

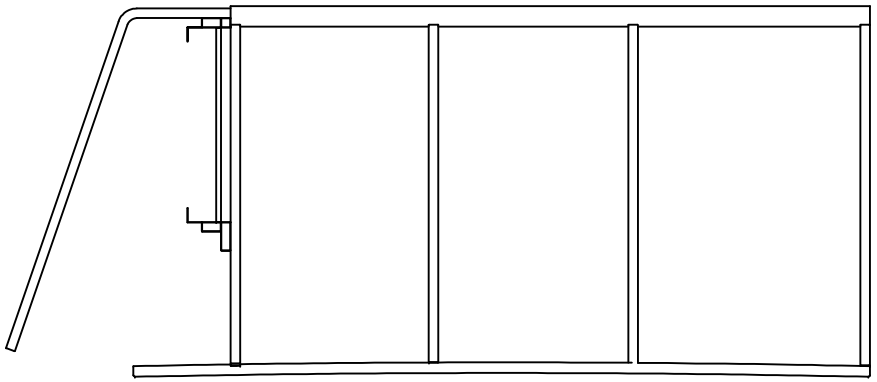
TITLE **Frame, Rear Wall Raised Floor With Door**

DWG. No. 31-28-0010-18 SPECIAL

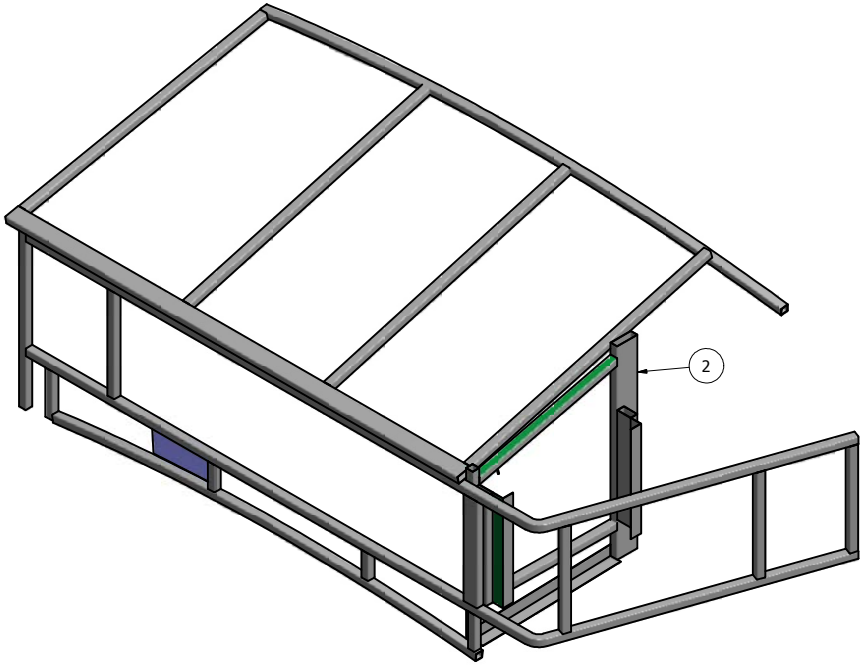
SCALE

DISK No.

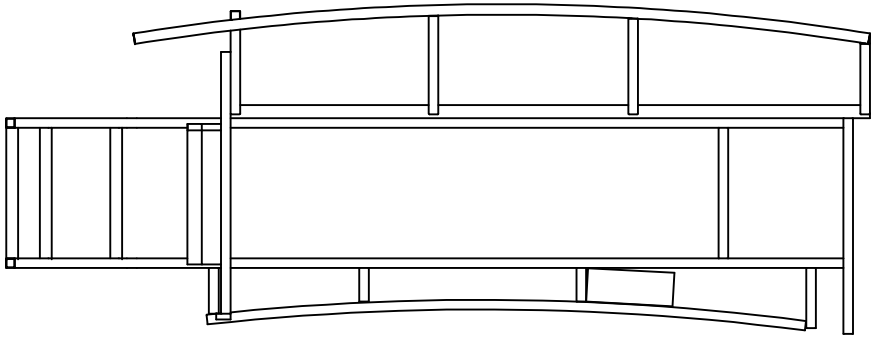
SHEET 1 OF 1



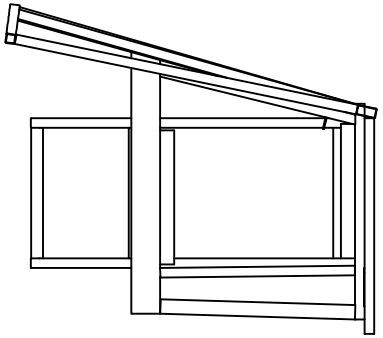
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



SIDE VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	31-28-0307-11	FORD Front Cab Wrap Around
2	1	31-28-0299-11	Ford Electrical Panel Frame
3	1	31-28-0745-11	FORD Cab Overhead

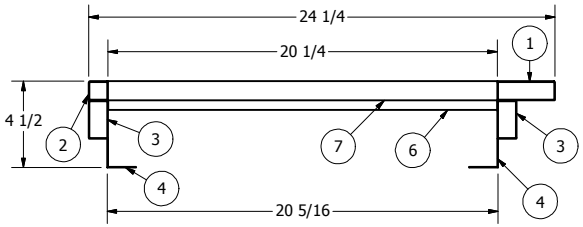
*****ALL MATERIALS GALVANIZED*****

Note:

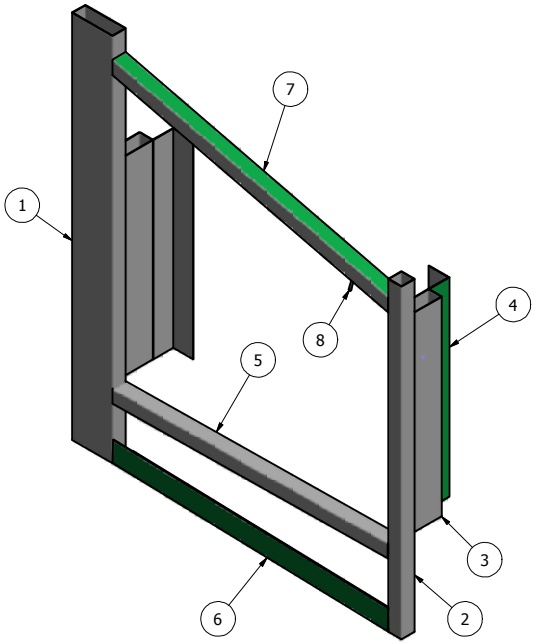
1). Viewed from Interior.

Glaval Bus
A Division Of Forest River, Inc.

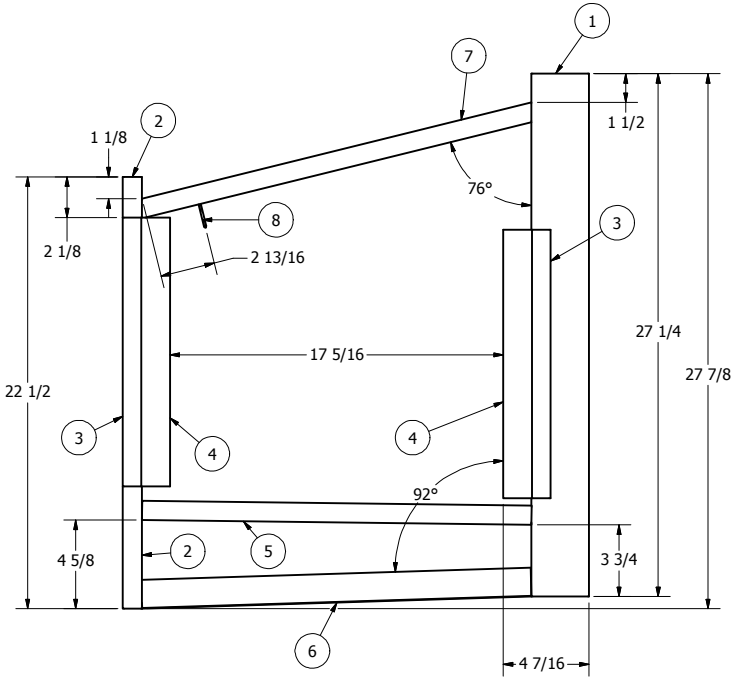
DFTSN:	TAS	TITLE	Ford Front Cab, Over Head Cab, Electrical Panel Assembly
DATE:	02/04/15	DWG NO	31-28-0993-15
		SHEET	1 OF 1



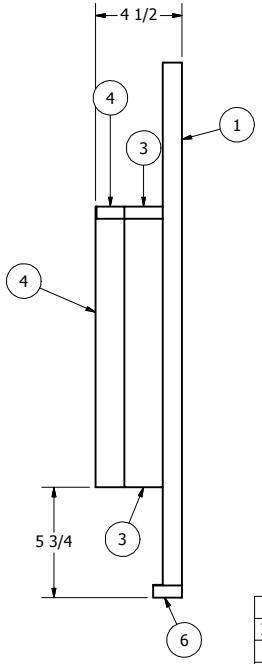
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



SIDE VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	1x3x27.25	Steel Tube 16ga. 1"x 3"x 27-1/4"
2	1	1x1x22.5	Steel Tube 16ga. 1"x 1"x 22-1/2"
3	2	1x2x14	Steel Tube 16ga. 1"x 2"x 14"
4	2	02071056-14	STEEL ANGLE 11ga.x 1-1/2"x 1-1/2"x 14" lg. A-513
5	1	1x1x20.25	Steel Tube 16ga. 1"x 1"x 20-1/4"
6	1	02071056-20.25	STEEL ANGLE 11ga.x 1-1/2"x 1-1/2"x 20-1/4" lg. A-513
7	1	1x1x21.125 Angle Cut	Steel Tube 16 ga. 1"x 1"x 15-1/4" Angle Cut
8	1	.25-20 x 1.25 Stud Grade 8	1/2" 13 x 2" Grade 8 Hex Head Bolt

*****ALL MATERIALS GALVANIZED*****

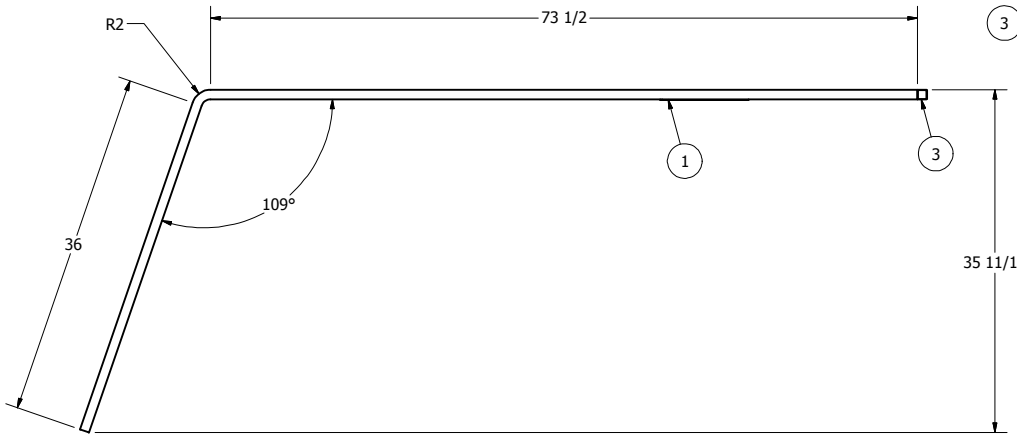
Note:

1). Viewed from Exterior.

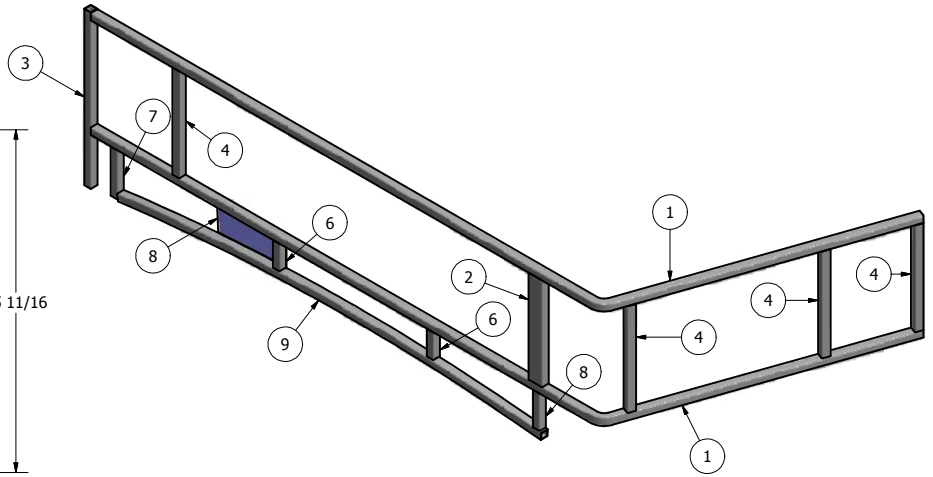
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	Released For Production	9/21/07	ELF
31-28	"B"	Update From Auto Cad To Inventor.. Updated To Match What Production Is Currently Building	11/14/07	TAS
31-28				

Glaval Bus
A Division Of Forest River, Inc.

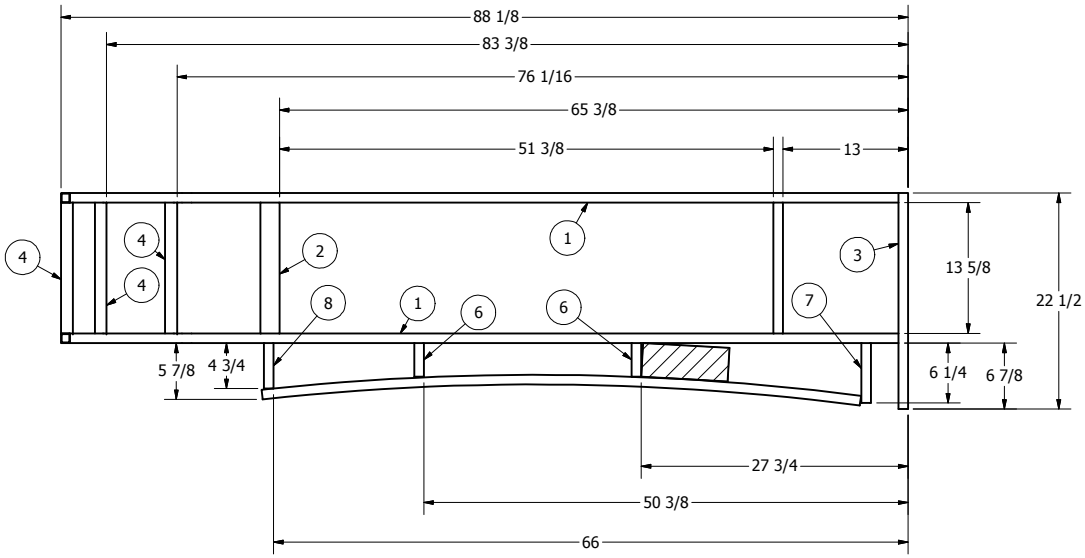
DFTSN: TAS	TITLE: Ford Electrical Panel Frame		
DATE: 11/07/11	DWG NO: 31-28-0299-11	SHEET 1 OF 1	



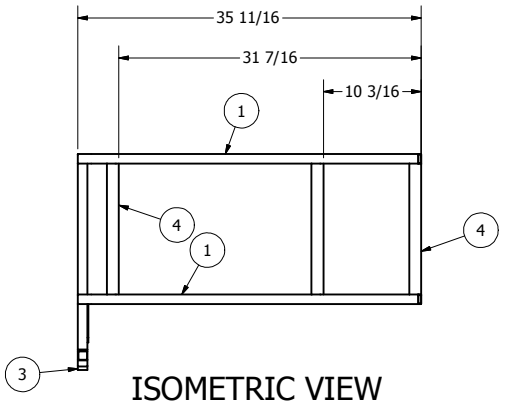
TOP VIEW



ISOMETRIC VIEW



BACK VIEW



ISOMETRIC VIEW

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	31-28-0747-11	Ford 1"x 1"x 16ga. Front Wrap Steel Tube
2	2	1x2x13.625	Steel Tube 16ga. 1"x 2"x 13-5/8"
3	1	1x1x22.5	Steel Tube 16ga. 1"x 1"x 22-1/2"
4	5	1x1x13.625	Steel Tube 16ga. 1"x 1-1"x 13-5/8"
5	1	1x1x15.625	Steel Tube 16ga. 1"x 1"x 15-5/8"
6	2	1x1x3.5	Steel Tube 16ga. 1"x 1"x 3-1/2"
7	1	1x1x6.25	Steel Tube 16ga. 1"x 1"x 6-1/4"
8	1	1x1x4.75	Steel Tube 16ga. 1"x 1"x 4-3/4"
9	1	1 x1 66.25 CAB CURVE	Ford 1"x 1"x 62-1/4" Steel Cab Radius Tube
10	1	1x1x4.375	Steel Tube 16ga. 1"x 1"x 4-3/8"

*****ALL MATERIALS GALVANIZED*****

Note:

1). Viewed from Exterior.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	Release To Production	10/26/2007	ELF
31-28	"B"	Changed Length of The Wrap Around Tubes	04/28/09	MDK
31-28	"C"	Update From Auto Cad Ton Inventor.. Updated To Match What Production Is Currently Building	11/14/2011	TAS
31-28	"D"	New Reviesed Standard 2015 Halo	02/05/2015	TAS

Glaval Bus
A Division Of Forest River, Inc.

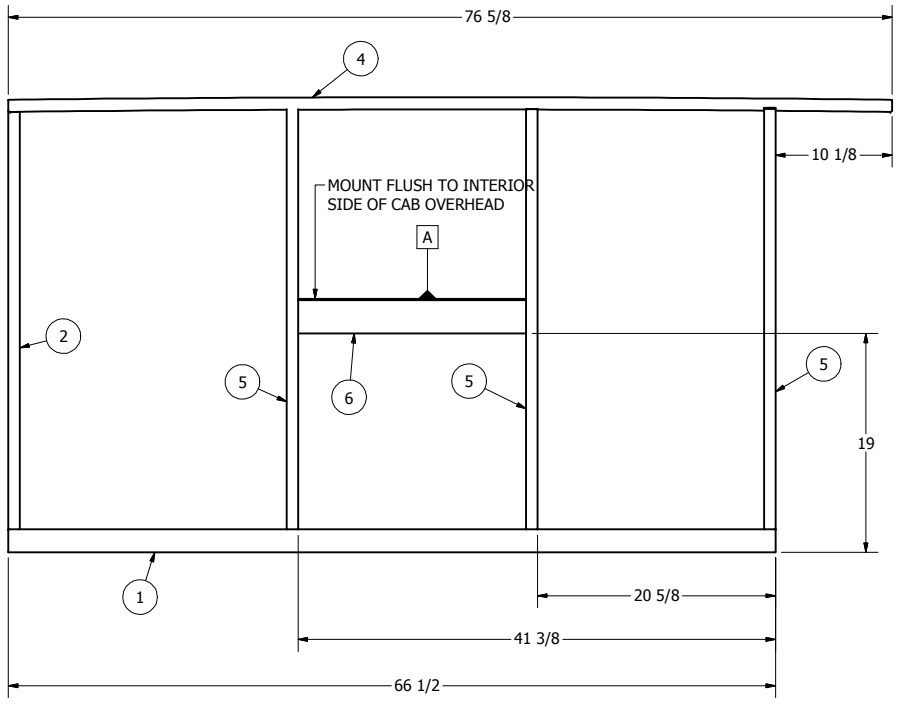
DFTSN: TAS

TITLE: FORD Front Cab Wrap Around

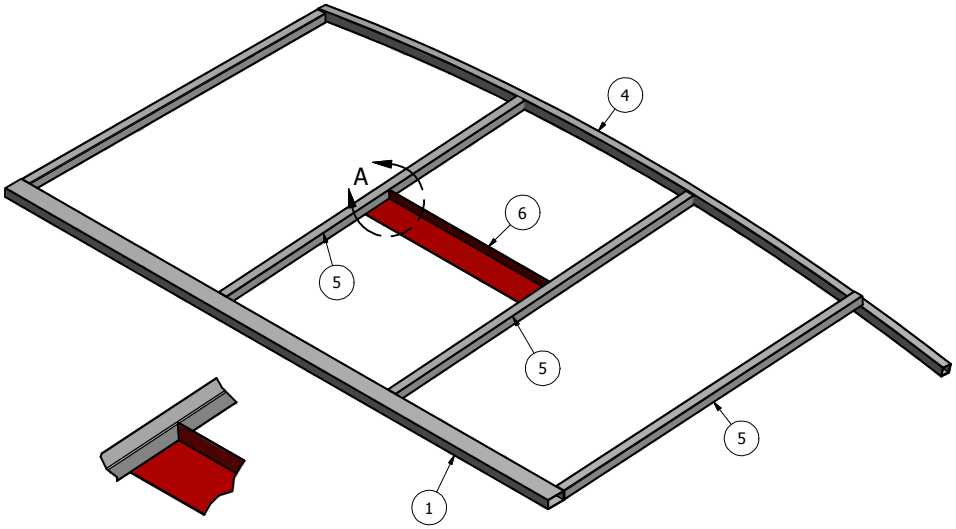
DATE: 11/07/11

DWG NO 31-28-0307-11

SHEET 1 OF 1

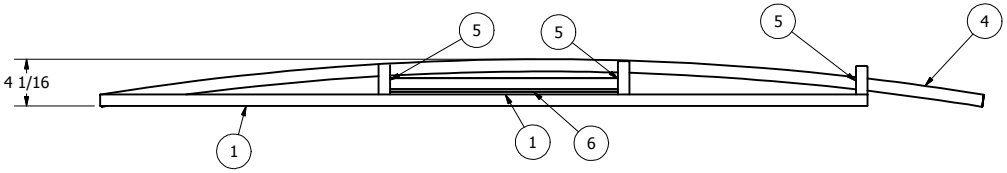


Top View

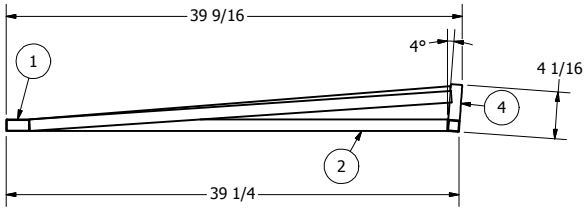


Isometric View

DETAIL A
SCALE 0.24 : 1



Front View



Side View

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	1x2x66.5	Steel Tube 16ga. 1"x 2"x 66-1/2"
2	1	1x1x36.25	Tube 16ga. 1"x 1"x 36-1/4"
3	1	1x3x7	Steel Tube 16ga. 1"x 3"x 7"
4	1	31-28-0750-11	Ford Allstar Radius Tube 1"x 1"x 76-5/8"
5	3	1x1x36.625	Aluminized Steel Tube 16ga. 1"x 1"x 36-5/8"
6	1	3 x 1x 19.75	STEEL ANGLE 16ga.x 3"x 1"x 19-3/4" lg. A-513
11	1	3 x 1x 19.75	STEEL ANGLE 16ga.x 3"x 1"x 19-3/4" lg. A-513

Note:

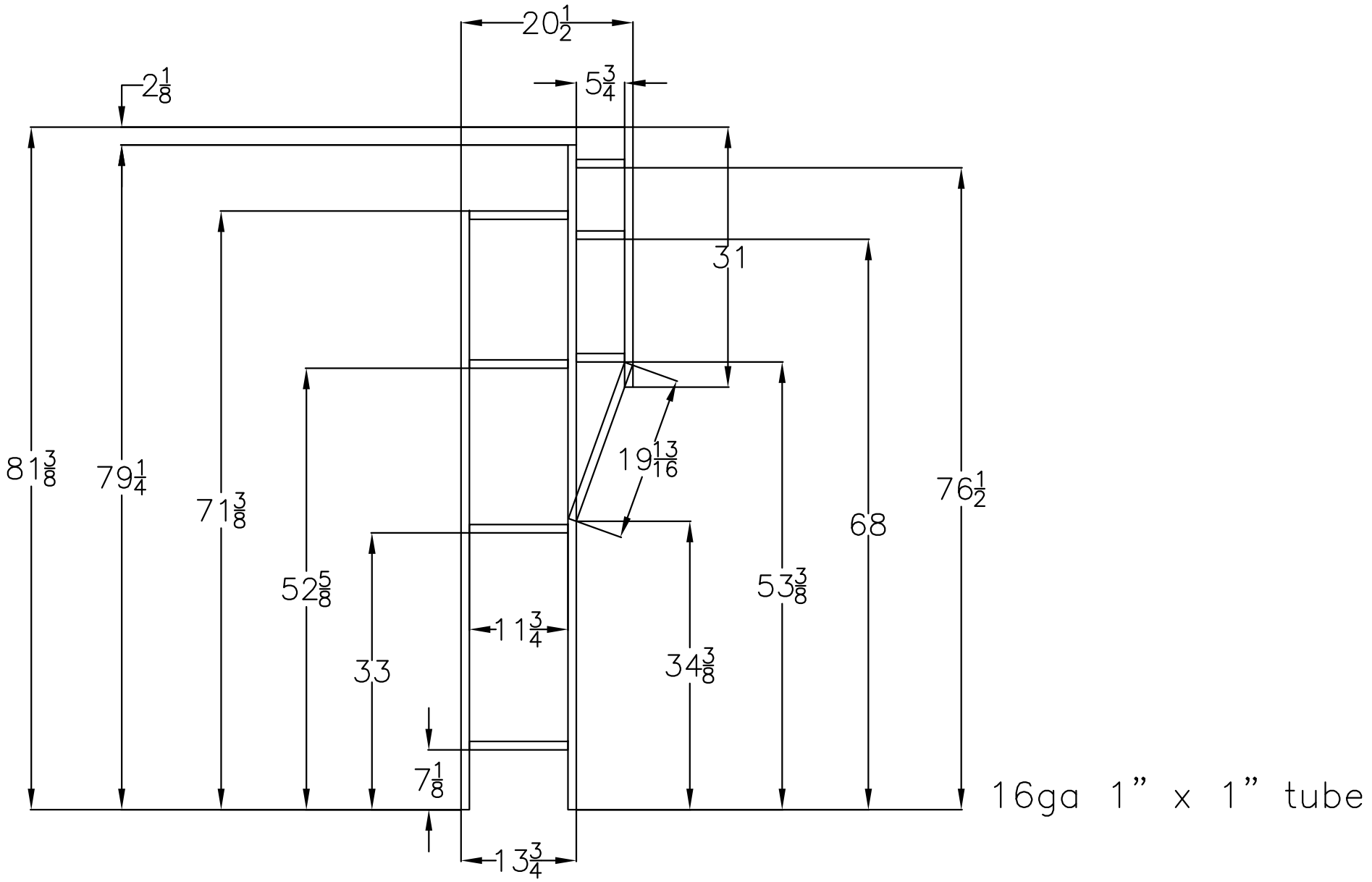
1). Viewed from Exterior.

*****ALL MATERIALS GALVANIZED*****

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
31-28	"A"	ADDED ANGLE FOR BACKER CENTER CEILING STRIPE	3/22/2015	TAS

Glaval Bus
A Division Of Forest River, Inc.

DFTSN:	TAS	TITLE	FORD New Syle Cab Overhead
DATE:	11/07/11	DWG NO	31-28-0745-11
		SHEET	1 OF 1



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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

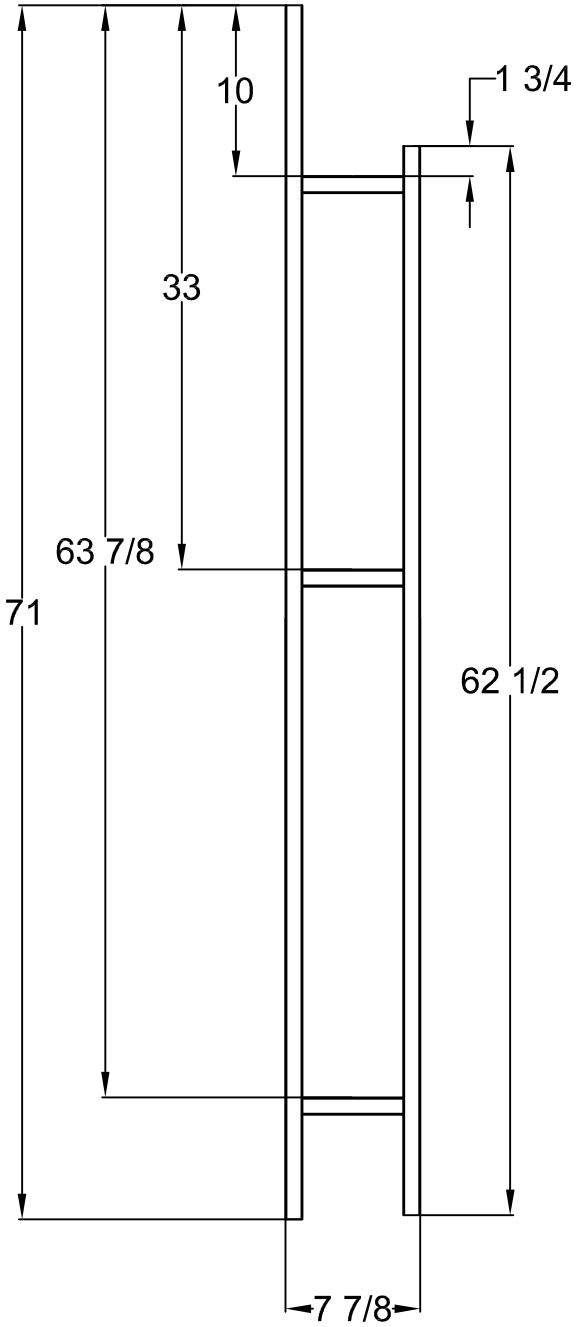
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

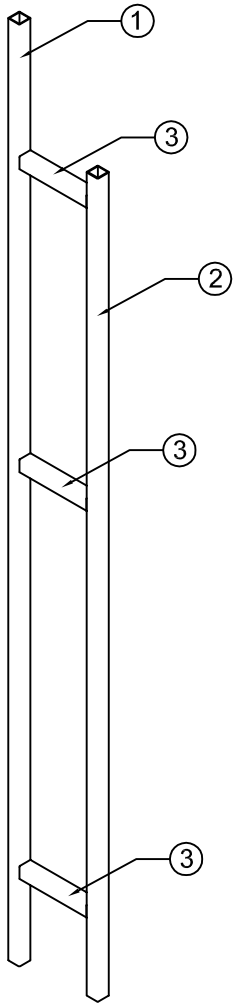
Glaval Bus *a division of Forest River, Inc.*

DATE: 7/27/17 NAME: MK

TITLE: **streetside pillar**

DWG. No. 31-28-0955-14





16ga 1" x 1" tube

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

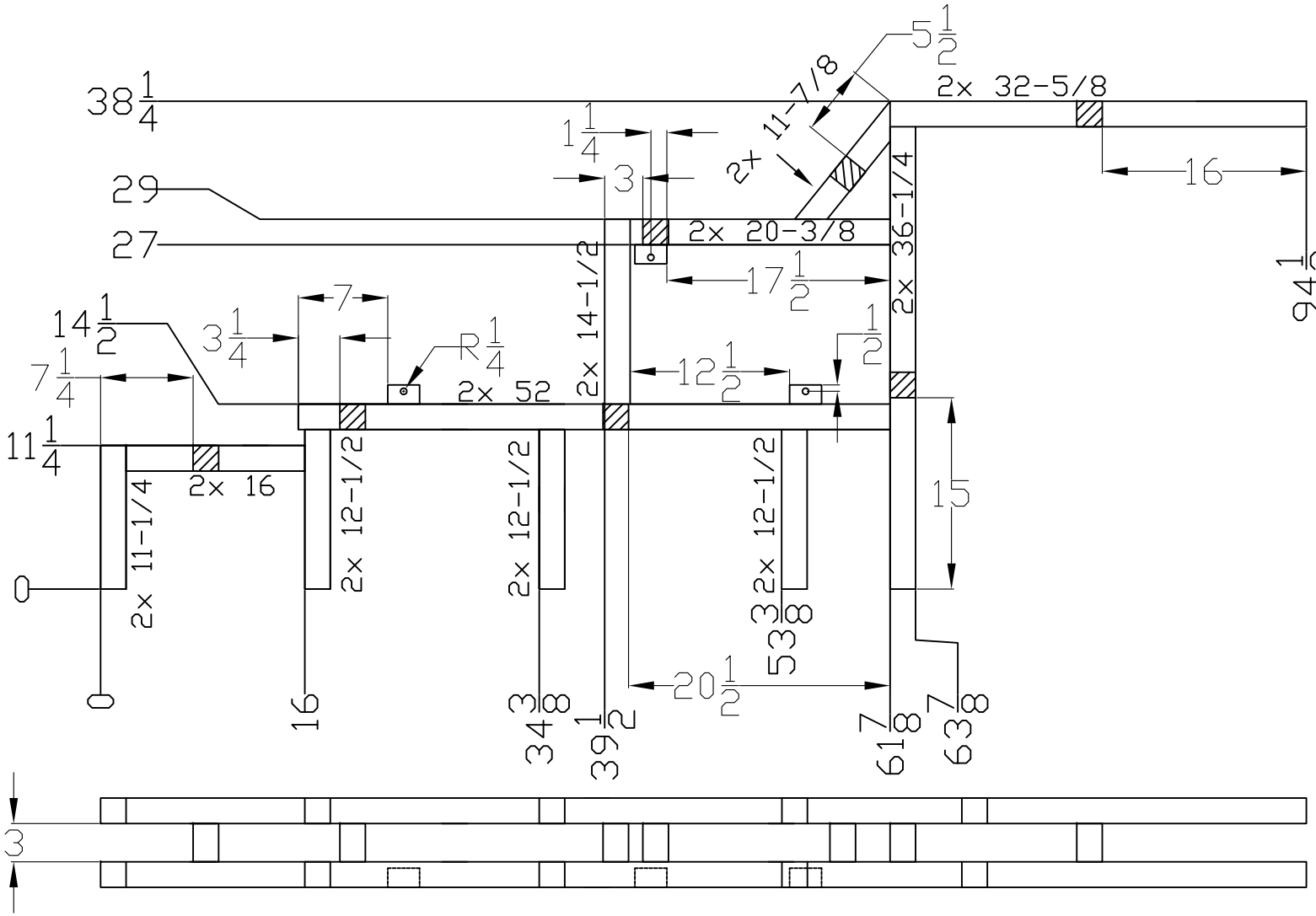
WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

Glaval Bus a division of Forest River, Inc.

DATE: 7/27/17 NAME: MK

TITLE: curbside pillar

DWG. No.



MAT'L=2" x 2" x 16GA.

ALL MATERIALS GALVANIZED

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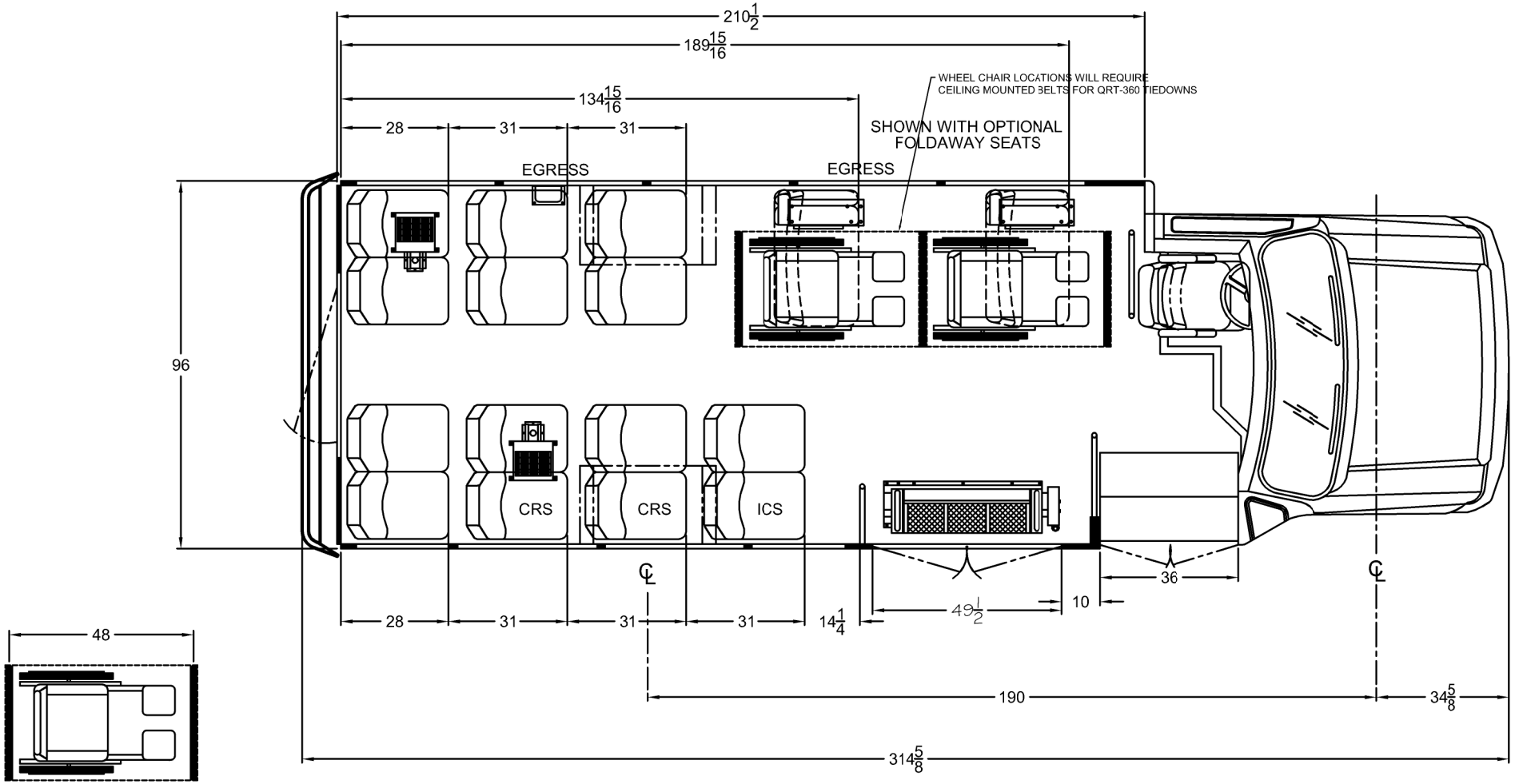
REV. LET.	DESCRIPTION OF CHANGE	BY	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	±1/16"
± 1°	±1/2°

Glaval Bus a division of Forest River, Inc.

DATE: 06/30/17
NAME: RTS
TITLE: RAISED FLOOR-3 STEP FALSE FLOOR ASSEMBLY
DWG. No. 31-28-0531-17C



DEALER APPROVAL

☐ APPROVED

_____

CUSTOMER SIGNATURE

NOTE: SHOWN WITH MID HI FREEDMAN SEATS
UNIVERSAL E-450 14,500 GVWR
THIS FLOOR PLAN IS FOR ILLUSTRATION PURPOSES ONLY.
A WEIGHT ANALYSIS HAS NOT YET BEEN PERFORMED.
FINAL APPROVAL WITH A WEIGHT ANALYSIS IS REQUIRED UPON RECEIPT OF A COMPLETED ORDER WITH ALL OPTIONS SHOWN.
OPTIONAL EQUIPMENT MAY BE SHOWN.
THE SALES ORDER PLACED DICTATES ACTUAL OPTION CONTENT.

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

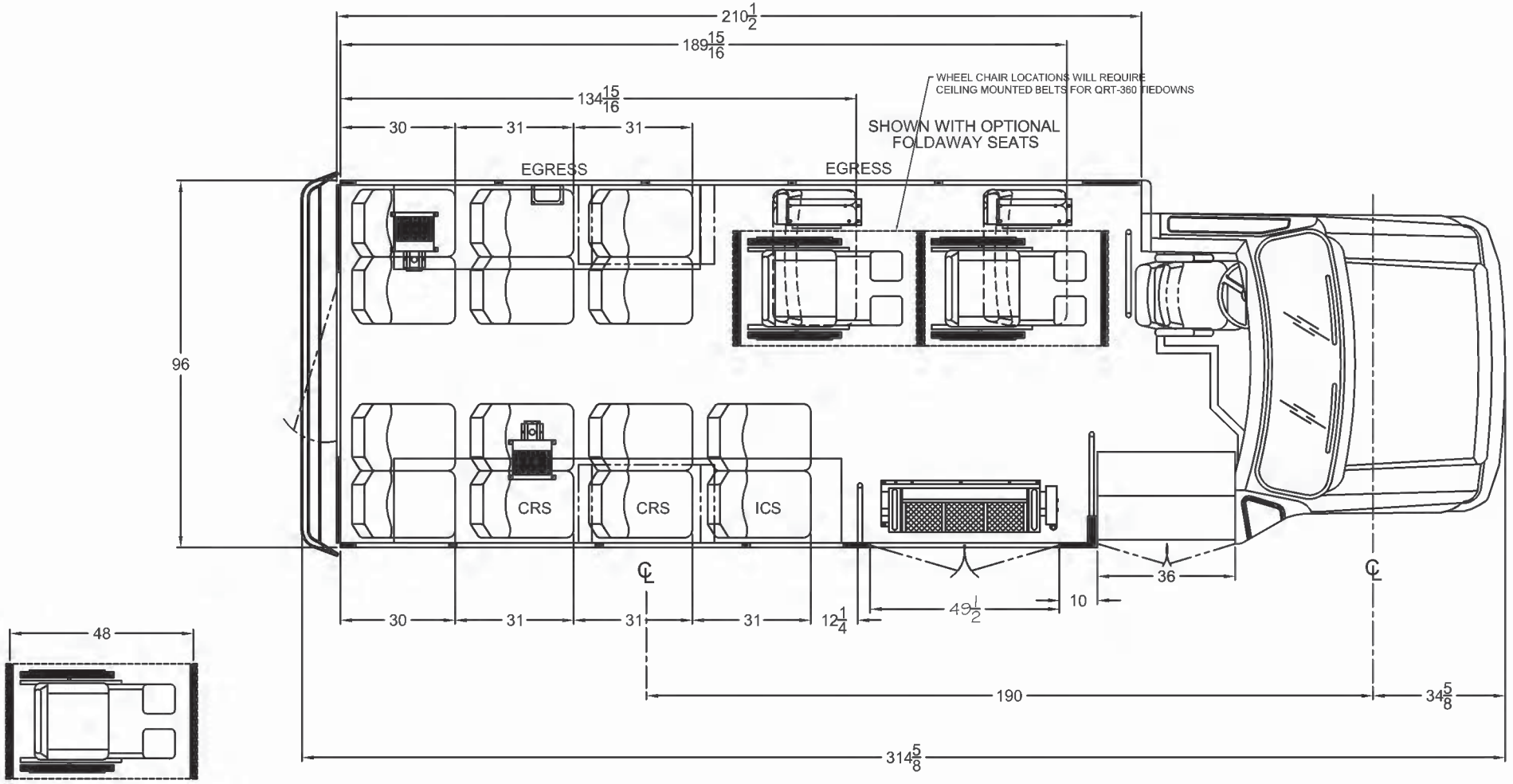
FOREST RIVER BUS

DATE: 07/27/18

NAME: JPC

TITLE: 14 PASS. 2 W/C 190" WB 26'

DWG. No. 14 2 WC 2 DB FOLDS 190 199-10 USA



DEALER APPROVAL

☐ APPROVED

_____

CUSTOMER SIGNATURE

NOTE: SHOWN WITH HI BACK FREEDMAN SEATS
UNIVERSAL E-450 14,500 GVWR
THIS FLOOR PLAN IS FOR ILLUSTRATION PURPOSES ONLY.
A WEIGHT ANALYSIS HAS NOT YET BEEN PERFORMED.
FINAL APPROVAL WITH A WEIGHT ANALYSIS IS REQUIRED UPON RECEIPT OF A COMPLETED ORDER WITH ALL OPTIONS SHOWN.
OPTIONAL EQUIPMENT MAY BE SHOWN.
THE SALES ORDER PLACED DICTATES ACTUAL OPTION CONTENT.

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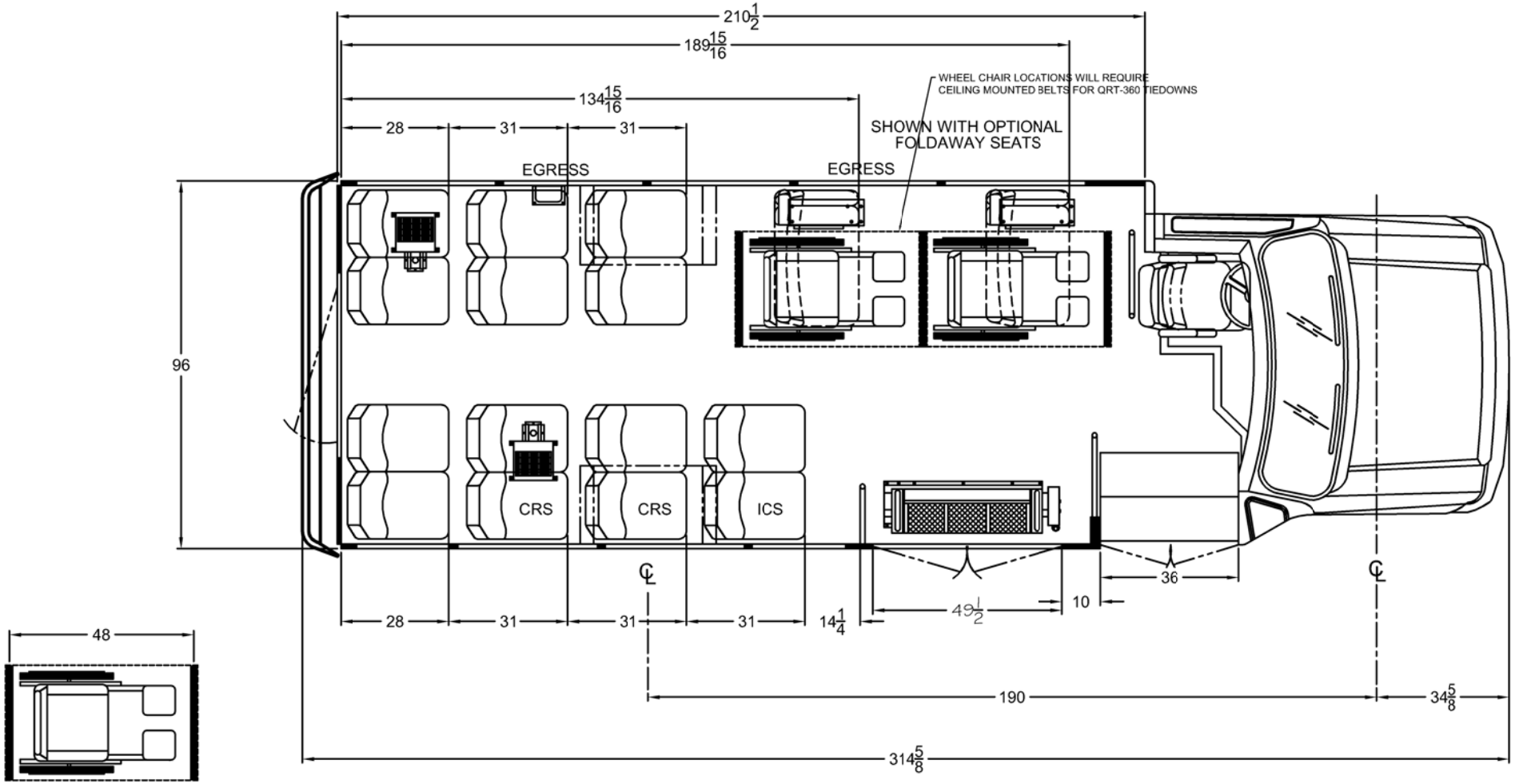
REV. LET:	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

FOREST RIVER BUS

DATE: 07/27/18
NAME: JPC
TITLE: 14 PASS. 2 W/C 190" WB 26'
DWG. No. 14 2 WC 2 DB FOLDS 190 199-11 USA



DEALER APPROVAL

☐ APPROVED

_____

CUSTOMER SIGNATURE

NOTE: SHOWN WITH MID HI FREEDMAN SEATS
E-450 14,500 GVWR
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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

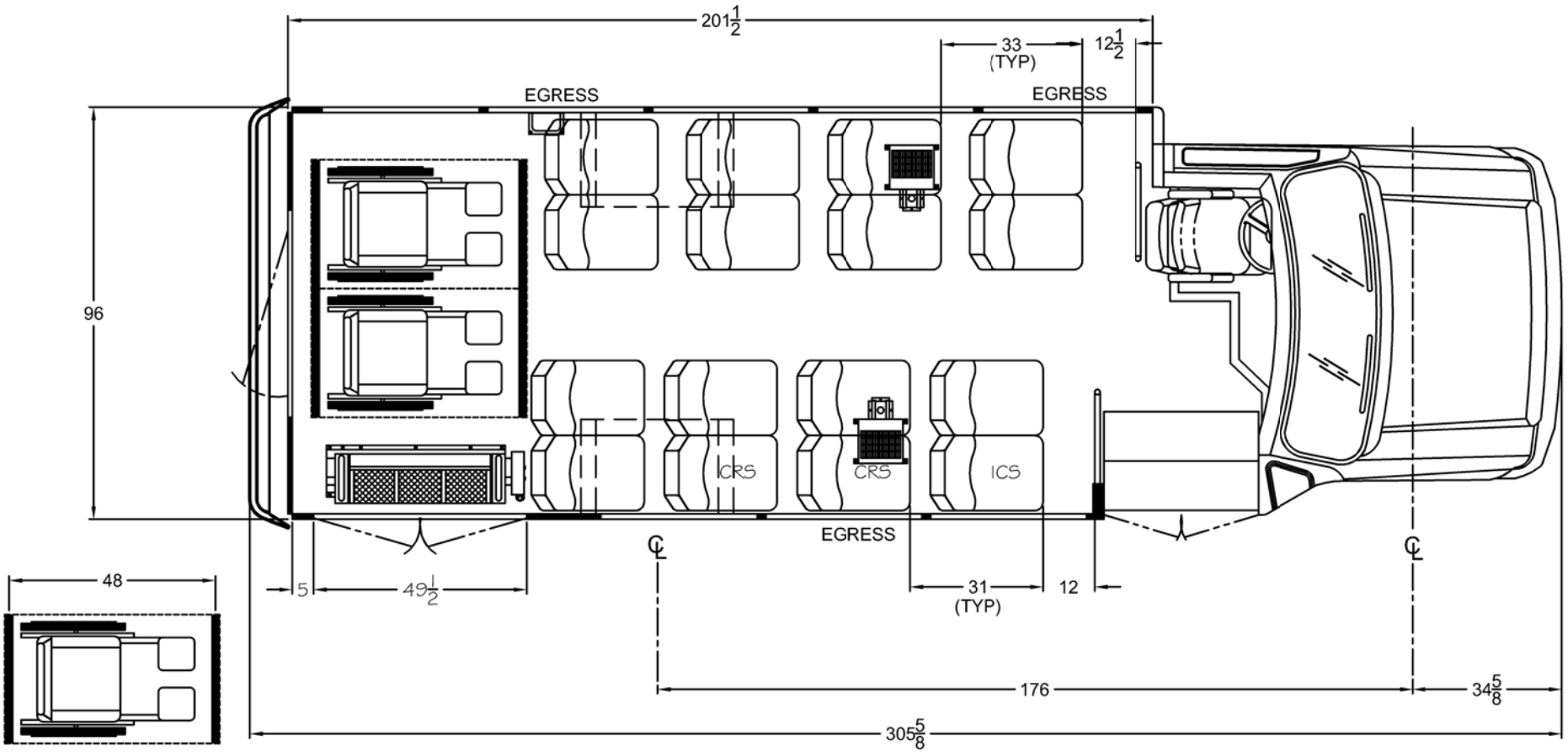
FOREST RIVER BUS

DATE: 07/27/18

NAME: JPC

TITLE: 14 PASS. 2 W/C 190" WB 26' E-450 WIDE BODY

DWG. No. 14 2 WC 2 DB FOLDS 190 199-10 USA



DEALER APPROVAL

☐ APPROVED

CUSTOMER SIGNATURE

NOTE: SHOWN WITH MID HI FREEDMAN SEATS
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SCALE IN INCHES 0 12 24 36 48

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REV. LET.	DESCRIPTION OF CHANGE	BY	CHK	DATE	ECN No.

TOLERANCE UNLESS OTHERWISE SPECIFIED

WOOD	OTHER
± 1/8"	± 1/16"
± 1°	± 1/2°

FOREST RIVER BUS

DATE: 07/27/18 TITLE: 16 2 WC PASSENGER 25' E-450 WIDE BODY

NAME: JPC

DWG. No. 16 2 WC 176 190-29 USA

WEIGHT ANALYSIS

7/31/2018 14 2 WC 2 DBL FOLDS 190 199-11 USA

	INPUT AREAS=						FUEL LOAD ADJ. DATA (F.L.A.)				
	VEHICLE DESCRIPTION:		CHASSIS	UNIT #	MODEL:	FUEL TYPE:	FUEL CAP.	FUEL WGT PER GAL.			
	14 2 WC 2 DBL FOLDS 190 199-11 US		E-450			GAS	55	6.1			
	WHEELBASE	PER IN. VALUE CALC.		AXLE WEIGHTS			FUEL AMT.	WGT OF FUEL	FUEL ADJ. AMT.		
	190	0.53		LEFT FRONT	RIGHT FRONT		0.13	335.5	-41.94		
AXLE CAPACITIES			4106	2158	1948		FUEL TANK CENTER		DEALER		
FRONT	REAR	TOTAL		LEFT REAR	RIGHT REAR		217				
5000	9600	14500	6072	2893	3179						
LEFT (ROADSIDE)						**RIGHT (CURBSIDE)**					
	DISTANCE (IN.)	WEIGHT (LBS.)	% REAR AXLE	FRONT	REAR	DISTANCE (IN.)	WEIGHT (LBS.)	% REAR AXLE	FRONT	REAR	
DRIVER	48	150	25.26%	112.11	37.89	162	-55	85.26%	-8.11	-46.89	MID DB
DBL FOLD	85	-85	44.74%	-46.97	-38.03	193	-55	101.58%	0.87	-55.87	MID DB
DBL FOLD	117	-85	61.58%	-32.66	-52.34	224	-55	117.89%	9.84	-64.84	MID DB
DBL FOLD	149	-85	78.42%	-18.34	-66.66	255	-55	134.21%	18.82	-73.82	MID DB
MID DB CRS	191	-57	100.53%	0.30	-57.30			0.00%	0.00	0.00	
MID DB CRS	223	-57	117.37%	9.90	-66.90	159	378	83.68%	61.67	316.33	HI BCK DBL ICS OH LUGGAGE
MID DB CRS	255	-57	134.21%	19.50	-76.50	191	369	100.53%	-1.94	370.94	HI BCK DBL CRS OH LUGGAGE
DBL FOLD	101	385	53.16%	180.34	204.66	223	369	117.37%	-64.09	433.09	HI BCK DBL CRS OH LUGGAGE
DBL FOLD	147	385	77.37%	87.13	297.87	255	367	134.21%	-125.55	492.55	HI BCK DBL OH LUGGAGE
HI BCK DBL OH LUGGAGE	131	372	68.95%	115.52	256.48			0.00%	0.00	0.00	
HI BCK DBL OH LUGGAGE	131	377	68.95%	117.07	259.93	190	-62.5	100.00%	0.00	-62.50	MORRYDE
HI BCK DBL OH LUGGAGE	222	377	116.84%	-63.49	440.49	275	-20	144.74%	8.95	-28.95	ROMEO RIM
			0.00%	0.00	0.00	179.5	-50	94.47%	-2.76	-47.24	3/4 PLYWOOD
			0.00%	0.00	0.00			0.00%	0.00	0.00	
MORRYDE	190	-62.5	100.00%	0.00	-62.50			0.00%	0.00	0.00	
ROMEO RIM	275	-20	144.74%	8.95	-28.95			0.00%	0.00	0.00	
3/4 PLYWOOD	179.5	-50	94.47%	-2.76	-47.24			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
	TOTAL PASSENGER LOAD			486.58	1000.92				-102.31	1232.81	2618.00
	AXLE WEIGHTS			2158.00	2893.00				1948.00	3179.00	10178.00
				FRONT	REAR	LEFT/RIGHT TOTALS	LEFT/RIGHT %'S				
			LEFT	2623.72	4061.56	6685.28	0.511				
			RIGHT	1824.84	4579.44	6404.28	0.489				
		FRT / REAR TOTALS		4448.56	8641.01	13089.56					
		AXLE CAPACITIES		5000	9600	14500					
		AVAILABLE CAPACITIES		**551.44**	**958.99**	**1410.44**					

ACTUAL LOOKS FROM 2015ST

FLIFT MID BCK MORRYDE 3/4 MARINE ROMEO RIM

Front Curbside

Maximum Capacity 2500

1824.84

Rear Curbside

Maximum Capacity 4800

4579.44

Combined Front

4448.56

5000 Maximum Capacity

Combined Rear

8641.01

9600 Maximum Capacity

2623.72

Maximum Capacity 2500

Front Roadside

4061.56

Maximum Capacity 4800

Rear Roadside

WEIGHT ANALYSIS

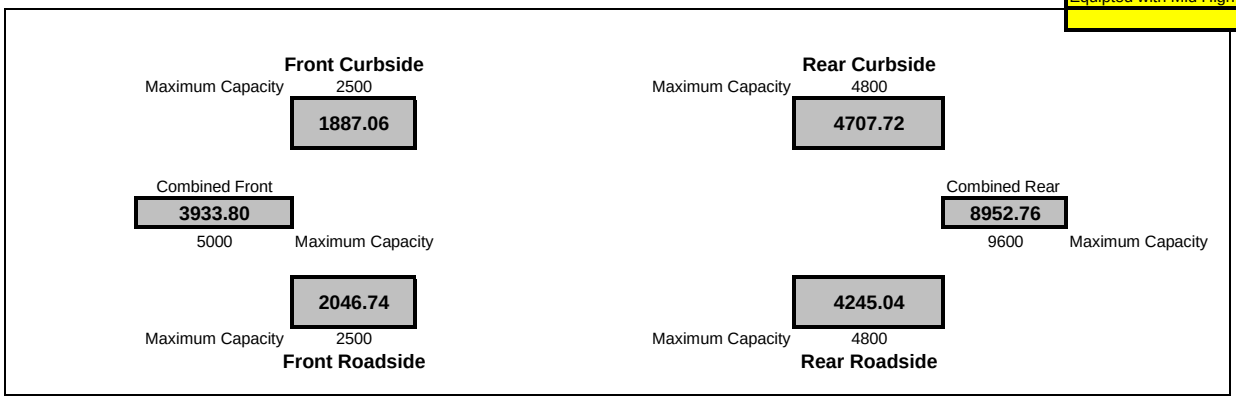
7/31/2018 16 2 WC 176 190-29 EST USA

	INPUT AREAS=						FUEL LOAD ADJ. DATA (F.L.A.)				
	VEHICLE DESCRIPTION:		CHASSIS	UNIT #	MODEL:	FUEL TYPE:	FUEL CAP.	FUEL WGT PER GAL.			
	16 2 WC 176 190-29 EST USA		E-450			GAS	55	6.1			
	WHEELBASE	PER IN. VALUE CALC.		AXLE WEIGHTS			FUEL AMT.	WGT OF FUEL	FUEL ADJ. AMT.		
	176	0.57		LEFT FRONT	RIGHT FRONT		0.13	335.5	-41.94		
	AXLE CAPACITIES		3536	1770	1766		FUEL TANK CENTER		DEALER		
FRONT	REAR	TOTAL		LEFT REAR	RIGHT REAR		203				
5000	9600	14500	6092	2825	3267						

	LEFT (ROADSIDE)					RIGHT (CURBSIDE)					
	DISTANCE (IN.)	WEIGHT (LBS.)	% REAR AXLE	FRONT	REAR	DISTANCE (IN.)	WEIGHT (LBS.)	% REAR AXLE	FRONT	REAR	
DRIVER	40	150	22.73%	115.91	34.09	94	-55	53.41%	-25.63	-29.38	MID DBL
MID DBL	90	-55	51.14%	-26.88	-28.13	125	-55	71.02%	-15.94	-39.06	MID DBL
MID DBL	122	-55	69.32%	-16.88	-38.13	156	-55	88.64%	-6.25	-48.75	MID DBL
MID DBL	154	-55	87.50%	-6.88	-48.13	187	-55	106.25%	3.44	-58.44	MID DBL
MID DBL	186	-55	105.68%	3.13	-58.13			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
MID DBL	90	355	51.14%	173.47	181.53	99	366	56.25%	160.13	205.88	MID DBL ICS
MID DBL	123	355	69.89%	106.90	248.10	130	357	73.86%	93.31	263.69	MID DBL CRS
MID DBL	156	355	88.64%	40.34	314.66	161	357	91.48%	30.43	326.57	MID DBL CRS
MID DBL	189	355	107.39%	-26.22	381.22	192	355	109.09%	-32.27	387.27	MID DBL
W/C	232	200	131.82%	-63.64	263.64	232	200	131.82%	-63.64	263.64	W/C
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
			0.00%	0.00	0.00			0.00%	0.00	0.00	
	TOTAL PASSENGER LOAD			299.26	1250.74				143.57	1271.43	2965.00
	AXLE WEIGHTS			1770.00	2825.00				1766.00	3267.00	9628.00

			FRONT	REAR	LEFT/RIGHT TOTALS	LEFT/RIGHT %'S
		LEFT	2046.74	4245.04	6291.78	0.488
		RIGHT	1887.06	4707.72	6594.78	0.512
		FRT / REAR TOTALS	3933.80	8952.76	12886.56	
		AXLE CAPACITIES	5000	9600	14500	
		AVAILABLE CAPACITIES	**1066.20**	**647.24**	**1613.44**	

Actual Weights from order 46118B
Equipted with Mid High seats



Z TECHNOLOGIES CORPORATION
World Leaders in Corrosion Protection

06/21/2017

MB#

Z GUARD ™ 9902 STAR

A wax based undercoating intended to protect commercial vehicles from corrosion. The wax electrochemically inhibits the rate of corrosion and also, due to the film characteristics, provides a coating resistant to stone impingement and elevated temperatures.

PHYSICAL PROPERTIES

Appearance	Black Liquid
% NVM by WT.	50
Density	10.43 lb/gal
Viscosity (after reduction with water)	
per Brookfield RVT #5 Spindle 20RPM	2500
Viscosity per #4 Zahn cup	26 sec.
Mechanical Stability	Excellent
Heat Stability	Excellent
V.O.C.	0.00 lbs/gal
D.O.T. Flammability Rating	>200q F
pH	8.5
Cryptometer/#2 Wedge, ASTM D1212	15
60° Gloss	< 5 matt finish)
Sag (mils)	>15

Z TECHNOLOGIES CORPORATION
26500 Capitol Avenue, Redford, Michigan 48239-2597
Telephone (313) 937-0710 · Fax (313) 937-1470

Z TECHNOLOGIES CORPORATION
World Leaders in Corrosion Protection

9/12/2013

MB # LB005 V1

Z GUARD 9902 STAR Film Properties

Performance testing reflects coating on unpolished Q panels with four day air-dried films at 3.0 – 4.0 mils dry.

Dry to touch at R.T., ASTM D1640	10 ± 2 minutes
Dry-to-Handle at R.T., ASTM D1640	20 ± 5 minutes
Pencil Hardness	6B
Flexibility 180° bend over conical mandral	Pass
Salt Spray, ASTM B117, 1000 hours	Field, scribe, edge clean; slight blistering
Salt Fog Resistance (463PB-10-01), 240 hours.	Pass (No rust)
♦ 500 F x 16 hours plus 240 hrs salf fog	Pass (No rust)
♦ 325 F x 16 hours plus 16 hours humidity.	Pass (No rust, nor blisters)
Salt Fog Resistance (WSS-M2P178-A), 240 hours.	
♦ 662°F x 1 hour; 1°C water quench; plus 240 hrs salt fog.	Pass (#8-9 corrosion rating or <0.1% surface rust per ASTM D 610-95)
Salt Water Immersion, 5% NaCl, 100° F, 96 Hours	Pass
Detergent Immersion, 100° F, 48 Hours	Pass
Gravelometer, ASTM D3170, -20° F	Good(8A)
Poultice, GM 998-5470, 20 cycles	Pass
Q.U.V., ASTM G53, 3000 Hours	Pass
Q.U.V., 100 Hours + Salt Spray, 336 Hours	Pass
Q.C.T., 3000 Hours	Pass
Humidity Resistance, ASTM D2247, 2000 Hours	Pass
Sag resistance	≥5 mils
Impact (direct & reverse) ASTM D3281	160/40 inch-lbs.
Adhesion (FLTM B1 6-1 B) cross Hatch	5A Pass
Scab corrosion resistance, 20 cycles	Pass

APPLICATION

For ultimate protection, apply films to clean metals at a thickness of at least four (4) mils dry, by any of the following methods:

Airless spray, with a 33:1 1.5 - 3.5 GPM, .013 - .026 tip at 50-75 psi line pressure, 20 - 40 fan

www.ztechprotection.com

Z TECHNOLOGIES CORPORATION
26500 Capitol Avenue, Redford, Michigan 48239-2597
Telephone (313) 937-0710 · Fax (313) 937-1470

3 Year Limited Warranty
on
Undercoating produced by Z Technologies Corporation
for use by
Forest River Bus

Subject to the terms, conditions and limitations in this Warranty, Z Technologies Corporation (the "Warrantor") hereby warrants to the original owner ("Owner") that the Z Technologies Undercoating used in the construction of Forest River Bus products meets the specifications set forth in Z Technologies' current Product Profile and when applied to Forest River products in the manner set forth in Z Technologies application recommendations, will protect those products from damage by rust for a period of three (3) years from the date of the Owner's purchase.

In the event that refurbishing is required as a result of damage caused by rusting within three (3) years of the Purchase Date, Warrantor's entire liability to Owner, and Owner's sole and exclusive remedy, will be to provide replacement undercoating, to advise Owner on proper refurbishing methods and to reimburse the cost of refurbishing up to the original cost of installing the undercoating on the unit in question. Owner will be responsible for all other costs and expenses in connection with the refurbishing, including transportation. Warrantor will not, under any circumstances, be responsible for special (except as expressly stated in this paragraph), indirect, incidental, consequential or punitive damages.

If corrosion damage appears to have occurred while this Warranty is in effect, Owner shall notify Forest River Bus within 90 days after discovery of same. Forest River Bus will, in turn, notify Z TECH. All claims made under this Warranty must be made to Z Technologies within 36 months after the Purchase Date. This Warranty shall have no effect unless Owner authorizes Z Technologies to inspect the unit on site. Z Technologies will make the final determination as to whether or not repairs are authorized under this Warranty. This Warranty does not apply to claims arising from damage due to:
Misuse, alteration or negligence, subsequent or additional coatings applied over or under the undercoating warranted, Dents, scratches, unusual contact , abrasion or fair wear and tear attributed to normal operating conditions. Failure to promptly repair damaged coating. Exposure to fire, heat, chemicals, explosion or any other natural causes.

The limited warranty provided herein is the sole and exclusive warranty with respect to Z Technologies undercoating. Any implied warranty, including any warranty of merchantability or warranty of fitness for a particular purpose, is limited in duration to the stated period of these written warranties. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

No dealer, salesman, representative or other person is authorized to make any warranties with respect to Undercoating, extend the warranty period or otherwise change modify or amend the provisions of this warranty.

This warranty is applicable only to the original Forest River Bus owner and may not be transferred to any other person, firm or entity.

Z Technologies, the Originators of Ziebart Protective Coatings

Z TECHNOLOGIES CORPORATION
World Leaders in Corrosion Protection

ISO 9001:2008 CERTIFIED

August 12, 2014

Subject: Z Guard 9902 Water Based Corrosion Preventative

To Whom It May Concern

Z Technologies Product, Z Guard 9902, was tested to the requirements of Specification A-A- 55295 which supersedes Specification MIL PRF 62218 which supersedes Specification TT C 520.

The test results are attached.

Based on the results of testing, Z Guard 9902 meets or exceeds the performance requirements of the specification.

The product Z Guard 9902 is widely utilized in the Commercial Vehicles OEM market and carries a three year corrosion warranty.

Sincerely

Ellis Breskman Ph.D.
Director of Research & Development
Dr. Kurt Ziebart Memorial laboratory

Z Technologies Corporation
26500 Capitol Ave.
Redford, MI 48239 USA
E Mail ellisbreskman@ztechprotection.com
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Cell 313 506 2772
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World Leaders in Corrosion Protection

Production Part Approval - Material Test Results

Supplier	Part Name
Z Technologies Corporation	
Name Of Laboratory	
Dr. Kurt Ziebart Memorial Laboratories	Z-Guard ® 9902

Material Specification

Spec. No.# 2 — **Com. Item Description A-A-59295** — Type I Motor Vehicles and Trailers

Superseding MIL - PRF - 62218B June 3, 1996; which supersedes TT C 520B

Originally issued Sept. 9, 1998

NSN 8030-01-127-3683

	REQUIREMENTS:	RESULTS	OK	NOT OK
3.1	**INGREDIENTS**			
3.1	Non Volatiles dispersed in petroleum solvent	water based	X	
3.1.1	no highly toxic ingredients	comply	X	
3.1.1.1	No benzene or HAPS	comply	X	
3.1.1.2	No halogenated hydrocarbons	comply	X	
3.2	**CHEMICAL AND PHYSICAL CHARACTERISTICS**			
3.2.1.2	Non Volatiles (weight) not less than 52% ± 5%	61%	X	
3.2.1.3	Wt per liter to not vary by more than 5% ASTM D1475	comply	X	
3.2.1.4	Sulfated Ash content. Each batch shall be within 10% of established value ASTM D95	comply	X	
3.2.2	Water Content shall be less than 1% ASTM D95	water based coating	X	
3.2.3	Lead Content less than 0.015% ASTM D3335	< 0.006%	X	
3.2.4	Flash Point not less than 100F ASTM D93	>240 F	X	
3.2.5	Condition in Container: no settling, lumps, skins, or separation of the solvent	comply	X	
3.2.6.2	Color. Color Brown or Black: no fluorescent pigments or dyes	black	X	
3.3	**PERFORMANCE PROPERTIES**			
3.3.1	Sag. Sag resistance ≥ 10 wet mils (250µ)	23 mils	X	
3.3.2.2	Creep: (1) expose 2 std cold rolled steel panels to 24 Hrs of ASTM 117 Salt Spray. (2) Clamp the panels together so that they overlap by 1/2 inch (3) apply the coating with a spatula to the joint (4) allow the test panels to stand in a vertical orientation for 7 days at room temp. (5) examine for creep of coating: no more than 0.25 inches allowed	creep 0.1 inches pass	X	
3.3.3	Copper Corrosion. The compound shall not be corrosive to copper when tested to ASTM D130. Test duration 3 hours. Test Temperature 100C. Copper strip classification value shall not exceed 1-b (slight tarnish, dark orange)	1-b Pass	X	
3.3.4	Fire Resistance: Expose the coating to a flame for 20 seconds. The coating shall not support combustion for more than 15 seconds after the flame is removed per ASTM D1310	flame out in 5 seconds: Pass	X	
3.3.5	Detergent Resistance. Immerse the dry coating into a solution of 2.5 grams sodium lauryl sulfate or equivalent per liter of water at 50C (122F) for 10 minutes. The coating must remain intact and continuous.	Slightly affected	X	
3.3.6	Chip Resistance. ASTM D3170 rating of 3A or better	4A Pass	X	
3.3.7	Solvent Vapor Wash Resistance. Place fresh wet film into non air circulation oven at 121C for 15 minutes. After 15 min cool at room temp, no evidence of sag, channeling, or removal from surface	no evidence of sag channeling or removal	X	
3.3.8	Condition to Touch. After 7 days at room temp, the coating shall be dry to touch	dry to touch: Pass	X	
3.3.9	Environmental. Testing shall conform to SAE J1959	Pass	X	
3.3.9.1	Low Temperature Stability. Expose the films to temperature of -20F for 16 hours. Film shall remain homogenous.	no effect: Pass	X	
3.3.9.2	Low Temperature Sprayability. Coating applies at temperatures 4C (40F) or above.	OK: pass	X	
3.3.9.3	Low Temperature Flexibility. Coating shall be flexible at temperatures -20F and above	Pass	X	
3.3.9.4	High Temperature Sprayability. The coating shall spray well 100F or below	Pass	X	
3.3.9.5	High Temperature Flow Resistance. Expose dry film to 300F for 2 hours: No sag allowed.	No Sag: Pass	X	
3.3.9.6	Salt Fog. Apply coating to corroded surface. Expose to 1000 hours per SAE J1959. Rating must be 2 or better.	ASTM Rating of 6: Pass	X	
3.3.9.7	Salt Water Immersion: Immerse dry film for 21 days in solution of 27.6 grams of NaCl,2.4 grams CaCl2 in one liter of water. Adjust pH to 7.8 - 8.2 with sodium carbonate. See SAE J1959. The compound shall inhibit corrosion.	Pass	X	
3.3.9.8	Cyclic Environmental conditions. Test to SAE J1959 section 3.12. The coating shall inhibit corrosion.	SAE J2334 Cyclic: Pass	X	
4	**REGULATORY REQUIREMENTS**	Material is recoverable	X	
4.1	Attempt to utilize Recovered Material			
5	**QUALITY ASSURANCE PROVISIONS**	certified to ISO 9001	X	
5.1	Contractor Required to perform all examinations and tests			
5.2	Same product as sold to the commercial market	same product	X	

The above test results were obtained from validation testing to CID A-A-59295 Type II.

Ellis Breskman PhD Technical Officer

MAY 12, 2014

Date

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