**Lincoln Special Engineering Operations** **QVM Programs - Engineering**
**Limousine Vehicles**

To: **Potential Limousine Vehicle - QVM Program Applicant**

Subject: **QVM Program Qualification Requirements – 2009 Model Year Update**

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## Background

The Qualified Vehicle Modifier (QVM) program focuses on the manufacturing of safe limousines, in conjunction with compliance with Federal Motor Vehicle Safety Standards (FMVSS), process and quality control, and a commitment to continuous improvement. This document is a review of the policies that are currently in place to coincide with the on-going changes of the QVM program and of the conversion industry.

The following provides a general overview of the QVM program requirements for new applicants and related conversion information for the Town Car & Expedition/Navigator. Complete conversion information is contained in the latest QVM Limousine / Hearse Builders Guide, & Expedition/Navigator Builders Guide. The information that follows pertains to the QVM Program for 2008 and later model year vehicles until further revised. Builders Guides can be viewed at our website: www.fleet.ford.com/limo

## QVM Program - New Builder Approvals

The following outlines the general process and highlights some of the major requirements for prospective QVM program applicants to qualify for the QVM Limousine Vehicles conversion program. The information provided is not meant to be complete, but is intended to provide a general overview of the QVM qualification process. Complete information regarding the qualification process can be obtained by contacting the QVM Engineering Office @ 313 / 322 - 7926.

***Note**: Neither Ford Motor Company or QVM Engineering makes any determination as to the safety of any specific QVM built vehicle. The information reviewed by QVM Engineering is for the purpose of auditing QVM manufacturers to determine if they comply with our recommendations. All QVM manufacturers are solely responsible for the certification and safety performance of their products.*

**PHASE 1** - A prospective applicant will be required to comply with the following as well as all other QVM program requirements to receive QVM Program approval:

- **Written Request for Consideration** - A prospective QVM applicant must first submit a written request stating their desire to be considered for QVM program approval. The request must contain the following:
  - √ Detailed Company / Corporation information - including parent company names or other substantial holding interests. Also, the names of all chief operating officers and key management.
  - √ Offices and manufacturing facility information - including location and facility size. Also, include any intended affiliation with other manufacturing organizations if the entire conversion process will not be performed at the main facility.

  ***NOTE:** A prospective QVM applicant or current QVM builder may not be involved in any way with another manufacturing facility that manufactures vehicles and is NOT intending to be, or, is not a member of the QVM program. This includes facilities / companies which build non-QVM compliant Ford Motor Company vehicles.*
  - √ Demonstrate the ability to secure a minimum of $5 Million of General Liability Insurance.
  - √ Projected start-up date.

- **Design** / **Model Information** - A prospective QVM applicant must provide the following information for each model or group of converted vehicles intended for production:

  √ Vehicle model or type (Limousine, funeral coach, 6-door, 24 hour car)
  √ Wheelbase extension lengths to be offered for each vehicle type
  √ Seating configurations available for each wheelbase extension and vehicle type, showing the designated seating positions **and** *seating area dimensions for each seating position.*
  √ Number of doors (if not the standard; 4), for each wheelbase extension and vehicle type (i.e.; 5,or 6)
  √ Total rated passenger capacity ***INCLUDING DRIVER*** for each wheelbase extension and vehicle type.

- **Weight Analysis** - In addition to a design report each QVM must submit a weight study detailing the actual or estimated weight of all added structure, including wiring, carpet, trim materials and included options (i.e.- sunroof, auxiliary A/C unit and hardware, electrical accessories,…). The weight analysis should start with the curb weight of a Town Car 418 Package (as received from the factory) or Navigator, and provide detail demonstrating that the added weight of the structure, passengers and luggage meets the QVM Gross Vehicle Weight (GVW) guideline of 7500 pounds for Town Car and 9900 (140 inch) for Expedition/Navigator. For analysis purposes, assume that the curb weight of a 418 Package Town Car is 4420 pounds, and the Expedition/Navigator is 5564 pounds. (see page 5 - section titled 'Vehicle Platform Requirements' for GWV information for hearse applications).

- **Product Design Assumptions** - The following design assumption or standards are to be used during the conversion design and development process. These standards are only guidelines and not intended to cover all situations.

  √ Weight / Passenger = 150 pounds
  √ Casket & Contents = 350 pounds
  √ Standard Luggage Load = 200 pounds
  √ *Minimum Luggage Load = 100 pounds ***(requires a restriction label)*** ***** **[luggage load restriction does NOT apply to hearse conversions.]**

- ****FMVSS** / **CMVSS Analysis-** Each prospective QVM applicant must provide documentation demonstrating compliance with all applicable FMVSS (CMVSS if exporting to Canada) for their proposed conversion design(s). Compliance statements must be provided for all applicable standards - including standards deemed to not be affected during the conversion process. For standards not affected during the conversion process, the statement should justify the conclusion as to why the standard was not affected. When providing FMVSS compliance statements for standards affected during the limousine conversion process, each coach builder should include a statement that answers the following fundamental questions:

  1. *What is the standard*; not just the title, but a short statement that describes the purpose and intent of the standard.
  2. *What does it take to pass the standard*; provide detail or a summary of how the standard is satisfied or what must occur to comply - this could include numeric and/or qualitative measures.
  3. *Why does your vehicle pass the standard*; indicate the actual or projected performance of your vehicle design with respect to the standard under review. Make comparisons and reference the standards acceptance criteria. Also, what supports your conclusions that your vehicle meets the standard ? This data must be accessible for inspection and review. Always ***reference*** testing data used for proof of compliance by test number, VIN, etc…

To assist the QVM Program members with determining compliance with government safety standards, Ford Motor Company has conducted analytical analysis and physical testing for several FMVSS standards typically affected during the vehicle conversion process. This data (commonly referred to as "group test data") is available to all members of the QVM program. This data is only applicable if all associated conversion guidelines and assumptions presented in this document and the QVM Limousine Builders Guides are followed. Any deviation or departure from these guidelines requires approval and written authorization from the QVM Engineering office. After successfully completing the requirements for 'Written Request for Consideration', 'Model/Design Information' and 'Weight Analysis' the QVM Engineering Office will loan the prospective QVM applicant this data for use in determining FMVSS compliance. This information is confidential and the property of Ford Motor Company. The documentation must be returned to the QVM Engineering Office if the prospective applicant does not successfully qualify for QVM approval.

*If a prospective applicant does not have adequate experience interpreting FMVSS regulations, the QVM Engineering Office strongly encourages that assistance from an experienced professional engineer be considered to assist in the interpretation of these standards. If this method is chosen, a full time employee of the company must be trained and dedicated as the FMVSS liaison to insure that the stated compliance is not affected during daily manufacturing operations.*

***Crash test data will be provided to the perspective QVM upon request. This process starts in PHASE 1, and is an ongoing process until statements of compliance are reviewed during the final 'on-site' inspection audit.***

**PHASE 2** - Once the steps in Phase 1 have been completed and reviewed by the QVM Engineering Office, the prospective builder will be authorized to begin manufacture of their first two QVM approved builds for the vehicle inspection process (see below). All conversions manufactured before completing these reviews are not eligible for QVM program consideration.

- **'Good Faith' Agreement** - Once a prospective applicant enters into the QVM qualification process they agree to follow the program guidelines as presented in this document and the Town Car Limousine / Hearse or Navigator Builders Guide. This 'good faith' agreement applies with the onset of the Phase 2 criteria until such time that the prospective applicant is either approved or disqualified from QVM consideration.

- **Facility & Converted Vehicle Inspection Audit** - After the above paper work has been received, reviewed, and approved by the QVM Engineering Office, an on-sight facility and vehicle inspection audit will be scheduled. At this time the prospective QVM will be authorized to convert two trial vehicles which will be reviewed at the audit. The vehicle inspection review will be conducted on one completed unit that represents the highest content / weight and longest extension length authorized during the Phase 1 review process. The second vehicle must be in a partial completion stage to allow for review of the interior structure and chassis modifications. This on-site inspection will focus on the following criteria:

  √ Facility and manufacturing process readiness **(see attachment 1: The QVM principals and rating system brochure)**

  √ Converted vehicle construction and verification to submitted design analysis and QVM guidelines. See the Builders Guide for details. www.fleet.ford.com/limo

**PHASE 3** - Once the above stages are completed successfully, the newly approved builder will be required / restricted to the following:

- **Sign a QVM Agreement** - The newly approved builder must sign a QVM contract and meet all the stipulations contained within the agreement.

- **Mandatory Probation Period** - The newly approved builder will be under a one-year probation period to assess their capability to meet program guidelines.

  √ **Vehicle Weights** / **Requirements** - For approval, a QVM manufacturer must acquire the use of and/or purchase scales in order to weigh vehicles at the appropriate GVW that applies. The weight information is documented on a QVM Weight Ticket. Each vehicle produced will require a weight ticket until written instruction from the QVM Engineering Office states otherwise. **(*See Attachment 3 below.*)**

  - ***Calibration information for your purchased scales must be available and scales must be recalibrated every calendar year.***

- ***Wheelbase Extension Length Limit*** *– Each new potential QVM will be able to produce any length vehicle that best suits their business case. The maximum length allowed by the QVM program is as follows.* ***Town Car = 120 & Expedition/ Navigator = 140 inches.*** *In order to ensure that quality and safety are maintained, the following criteria has been established as a requirement for building vehicles at their maximum limit for new QVMs.*

  - *The first 25 vehicles produced will be required to have the following documentation*
    - *A QVM weight ticket showing* ***all*** *weights required (see attached QVM weight ticket)*
    - *Owner information for the vehicle including; Company name, address, phone number, email address, and contact name if different from the company name.*
    - *A written approval (email or otherwise) from this office for the release/sale of each vehicle is required before they can be released to the end customer.*

  ***** The QVM Office reserves the right to review the above information and conduct surveys of vehicle customers to assess the newly approved builder's capability to meet QVM requirements for quality, customer satisfaction, and conversion design and durability considerations.***

- **6 - Month Interim Status Review** - The QVM Engineering Office will conduct an interim status review to confirm the newly approved QVM builders performance to program objectives. This review will examine the following:

  √ Feedback on Conversion Quality and Customer Satisfaction from the FCSD Hotline (800/ 34-FLEET)
  √ Customer Satisfaction Mail / Phone Survey Results ( If deemed necessary)
  √ Certificate of Completion Reports / Incentive Program Compliance
  √ Compliance to Conversion Restrictions / Guidelines

***See Attachment 2 - Flow Chart / New Builder Approvals - for a summary of the qualification process.***

## Vehicle Platform Requirements

QVM approved conversions are to be constructed on the indicated heavy-duty option packages and are required to meet the following GVW guidelines. Contact the QVM Engineering Office for more information or questions concerning vehicle platform capabilities.

- All conversions must be completed on the specified heavy duty package:
  - ✓ Town Car Limousine - 418 option package
  - ✓ Town Car Hearse - 418 or 419 option package (dependent upon availability)
  - ✓ Lincoln Navigator & Ford Expedition – 17 L Limousine Builders Package

**Note:** Any **other** Ford Motor Company vehicles than the ones mentioned above are restricted from conversions and will lead to immediate dismissal from the QVM program. All following vehicle brands are restricted from conversion:

- Ford
- Lincoln
- Mercury
- Mazda
- Volvo

***The QVM Spirit***

*QVM certification is not just a program for vehicle modification. QVM envisions complying with the spirit of the program and is intended to create trust between the customer, coachbuilder, and chassis manufacturer with a goal of producing vehicles that meet approved crash and durability standards. QVM is not intended to simply provide a mask (certification) to hide behind, or solely a method for receiving conversion incentives to increase QVM profitability. QVM is about doing the right thing with all partners involved in the business, even if QVM is not the most convenient or aggressive path available.*

Therefore, a QVM builder may **not** be involved in any way (including ownership, partial ownership, or receiving profits) with another manufacturing facility that manufactures vehicles outside of the QVM program guidelines, and is **not**, or not intending to be a member of the QVM program. This specifically includes facilities / companies which build non-QVM compliant Ford Motor Company vehicles including all Ford Motor Company affiliated vehicles such as: Ford trucks, Jaguar, Lincoln, Lincoln trucks, Land Rover, Mazda, Mercury, Volvo, and Aston Martin. Affiliation with such a company is grounds for immediate dismissal from, and loss of all benefits associated with the QVM program.

If you need further clarification of this policy, please call the QVM Engineering Office: 313 / 322 - 7926

## Platform Maximum Weights

- GVW limits for QVM approved conversions are as follows:
  - √ Town Car Limousine = 7500 pounds
  - √ Town Car Hearse = 6800 pounds
  - √ Lincoln Navigator = 9,900 pounds
  - √ Ford Expedition = 9,900 pounds

The following information provides a general overview of some of the new or revised conversion requirements associated with the QVM program. These requirements are applicable to all QVM conversions unless indicated otherwise. The information provided is not meant to be complete, but is intended to provide an overview for product design and development purposes.

- **B-Pillar Body Reinforcement** - **Full OEM B-pillars are required at all locations in the conversion.** B-pillars must be purchased from the approved OEM source. QVM Engineering must approve any modifications to the OEM B-pillar. The chart below provides detail on B-pillar usage, specific requirements for center pillar supports.

B-Pillars / Pillar Spacing

⇒ Only OEM factory approved B-Pillars may be used at door locations. Contact Infinite Innovations at (417) 863 - 0300 to purchase OEM approved B-Pillars
⇒ B-pillars can not be split or modified in any way except as specified in the chart on page (6)
⇒ Center pillar requirements (conversions over 70 inches - see chart on the following page ( 6) for details)
⇒ **All pillars MUST be welded with a full / continuous seam at the top, bottom, inside and outside attachment points !**

**B-Pillar Body Reinforcement**

| Span Length | Acceptable B-Pillar Types (center) | Acceptable B-Pillar Design (center) | Action Required for QVM Approval * |
|---|---|---|---|
| 70" or less | - not required - | - - - | - - - |
| 71" - 100" | Full (rocker-roof) | OEM Approved | • provide attachment, support structure, & design information for review |
| " | ½ (rocker-beltline) | OEM (modified) | • provide attachment, support structure, & design information for review |
| over 100" | Full (rocker-roof) | OEM Approved | • provide attachment, support structure, & design information for review |

* Contact the QVM Engineering Office ***before proceeding*** for more information

- **Frame Rail Extension Design** - *The following **two (2)** frame rail extension designs are approved for QVM conversions for Town Car. Excursion frame material is different and specified below. *** All other designs must be reviewed and approved by the QVM Engineering Office.*

***Town Car**: Frame rail extensions must be constructed of A500 structural tubing*

√ *Three-piece lap tube design with a minimum wall thickness of 3mm*
√ *One-piece closed cross-section 2"x4" tube with a minimum wall thickness of .1875" or 3/16"*

***Expedition / Navigator***

❖ *Expedition/Navigator Frame information can be found in the SUV Builders Guide.*

****** All Builders Guides for all vehicles may be viewed on our website at www.fleet.ford.com/limo***

- **Frame Cross-Member Support (Town Car Only)**- all conversion designs with wheelbase extensions over 70 inches must incorporate a rigid under body cross-member attached between the sides of the vehicle frame. The cross-member is required for side impact and must meet the following design criteria:
  - √ The cross-member must be positioned at a location which is 89 (+/- 1.0) inches from the centerline of the front axle (imaginary line between center of the two front wheel spindles).
  - √ The cross-member must be constructed of a closed cross-section (i.e.- box, rectangle, tube) and equivalent in strength and performance of a 1"x 3" rectangular tube, 0.065" minimum wall thickness, 1010 steel.
  - √ The cross-member should span the distance from the frame side rails in a straight line if possible. If the cross-member must be cut to clear obstructions, any cut lines and/or seams must be reinforced (i.e. - gusset plate).

- **Side Impact Intrusion Beam** - The side impact beam for the extended section of the converted vehicle must meet or exceed the following guidelines:
  - √ 1010 steel
  - √ Tubular design - standard 2" x 2" x 0.095" square tube or other cross-section of equivalent or greater bending strength. Round 1 inch O.D. tubing sold by Infinite Innovations is also acceptable. Contact Infinite Innovations for specifications and pricing.
  - √ Maximum unsupported span (distance between B-pillars) of 70 inches.
  - √ Rigidly attached at each B-pillar

- **Roof Supports** - OEM style (or equivalent) roof supports must be located and positively attached at each B-pillar reinforcement.

- **Driveshaft Length** - The OEM driveshaft length can not be extended. Multiple section drive shafts are required for all wheelbase extensions.

- **Center Divider Attachment** - The center divider (i.e.-partition) must be rigidly attached to the body structure.

- **Body Cut Line** - the body separation cut line must be rearward of the front door B-pillar.

- **Door Configuration** - Vehicle designs with wheelbase extensions over 100 inches which incorporate more than four (4) doors **must be reviewed and approved by QVM Engineering**.

- **Framing Fixture** - All QVM manufacturers are required to incorporate a rigid vehicle cutting fixture during the extension process. This fixture must be constructed to reference the master locator holes of the OEM frame. This will insure accuracy during the extension process and prevent excessive front to rear axle thrust angle concerns. **This fixture must be in place and functioning at the time of the annual QVM audit.** *Details on the cutting fixture are in the Builders Guide. You can view the Builders Guide Online at* ***www.fleet.ford.com/limo***

QVM Program - Key Contact List

The chart below provides the contact names / numbers for several areas that support a prospective builder during the QVM application process.

| **Questions Regarding** | **Contact-Area** | **Phone (p) / Fax (x)** |
|---|---|---|
| The QVM Program, The QVM application process, engineering or the conversion process | Jeff Metz - QVM Engineering Office (jmetz@ford.com) | 313-322-7926 **p**<br>313-390-3160 **x** |
| • Incentive program information<br>• Town Car & SUV order status<br>• Advertising information,(clip art, brochures) | Kim Johnston- QVM Fleet Office (kjohnst3@ford.com) | 313-390-2779 **p**<br>313-390-3488 **x** |
| QVM incentive process, claim forms, payment schedule | Kim Johnston- QVM Fleet Office | Same as above |

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|---|---|---|
| Financing, or setting up a credit line for purchasing QVM limousines | Ford Motor Credit Commercial Lending Services | 800-706-0997 **p** |
| -Acquiring a Fleet Identification Number (FIN) - (required to order and purchase Town Car 418/419 option Limousine/Hearse Builders Package chassis 17 L Navigator & 800A Excursion limo chassis)<br><br>-Fleet Service Assistance | Ford Fleet Business Office. Commercial Vehicle Operations | 800-343-5338 **p**<br>For FIN info follow the menu.<br><br>For Fleet Service ONLY! use:<br>*Menu pick – 3* |
| Purchasing OEM approved B-pillars required for QVM approved limousine conversions & alternative round crash beam bar material. | Bud Thomas- Infinite Innovations | 417-863-0300 **p**<br>417-863-0320 **x** |

If you have any questions or need more information, please contact me or the QVM Engineering Office.

*Jeff*

Jeff Metz
QVM Engineering Office /Program Coordinator
313 / 322 - 7926

*Jim*

Jim Murray
QVM Engineering Manager
313 / 248 - 9819

**Attachment 2**

# QVM New Builder Approval Process

**Phase 1 - Analytical Review** --> QVM candidate:
- Submits written request to QVM Engineering Office for review
- Begins the process to develop analytical conversion information
- Applicant submits analytical studies for review

RESUBMIT

QVM Engineering Office reviews applicant's Phase 1 conversion design & FMVSS analysis

FAIL

- QVM Eng. provides feedback & identifies concern areas / requirement shortfalls
- Applicant develops resolution plan & re-submits to QVM Engineering for approval

PASS

RESUBMIT

QVM Engineering conducts a preliminary phone audit to assess facility and manufacturing process readiness

FAIL

- QVM Eng. provides feedback & identifies concern areas / requirement shortfalls
- Applicant develops resolution plan & re-submits to QVM Engineering for approval

PASS

**Phase 2- Vehicle Construction / Facility Inspection Stage**
- Applicant agrees to comply with provisions of the 'Good Faith' Agreement
- QVM Engineering schedules a tentative facility inspection date to review:
  - readiness to QVM manufacturing / process requirements
  - confirmation of analytical analysis provided in Phase 1
- QVM applicant is authorized to convert two trial vehicles for inspection during the facility audit to review compliance with QVM conversion practices & guidelines.
  - one fully completed unit representing the highest content / weight and extension length approved for manufacture
  - one unit partially completed to allow a structural review of the added interior / chassis sections & to assess manufacturing practices

FAIL

PASS

**Phase 3 - Applicant Approved**
- QVM agreement signed
- Mandatory probation period begins
- Conversions limited to approved designs & wheelbase extension limit
- New QVM builder begins compiling certified conversion weight data

PASS

- QVM Eng. Identifies areas of Non-compliance
- QVM Eng. Assesses Impact of concerns & ability to correct areas of non-compliance
- Corrective Actions reviewed / discussed
- QVM Eng. Assesses coach-builder capability to meet program guidelines & correct vehicle defects.

Not Approved

- Qualification request deferred until next program year

***CONGRATULATIONS !!***
***Welcome to the QVM Program***

***Attachment 2***

# OFFICIAL QVM WEIGHT TICKET

**General Information:**

VIN:

VEHICLE TYPE: LIMO HEARSE EXC NAV

TOTAL WHEELBASE EXTENSION INCHES

SEAT CONFIGURATION : J, L , BENCH TOTAL PASSENGERS INCLUDING DRIVER

RIGHT FRONT PASSENGER SEAT INSTALLED? YES NO

**Weight Data:**

TIRE PRESSURE: LF RF LR RR

CURB WEIGHT–CORNERS : LF RF LR RR

CURB WEIGHT TOTALS: FRONT REAR TOTAL LBS

NORMAL LOAD – CORNERS: LF RF LR RR

*Not needed for trucks!

NORMAL LOAD TOTALS: FRONT REAR TOTAL LBS

MAXIMUM GVW – CORNERS: LF RF LR RR

MAXIMUM GVW TOTALS: FRONT REAR TOTAL LBS

PLEASE INDICATE FUEL LEVEL: EMPTY 1/4 1/2 3/4 FULL

**Scale Information and Certification of Data:**

SCALES USED TO MEASURE:

MANUFACTURER:

DATE LAST CERTIFIED: month day year

**The information above is certified to be accurate:*

*QVM (company name)*

*Authorized Employee:*

DATE

**ALL Vehicle Weight Tickets TO: jmetz@ford.com**

*email ONLY!!*