EA03-004

FORD 8/27/03

ATTACHMENT J

BOOK 1 OF 3

PART 4 OF 4

From: Seashore, Patricia (P.J.)
Sent: Tuesday, September 19, 2000 6:49 PM
To: Hayde, Mary Ellen (M.E.)
Subject: FW: CCRG - Wheel concern

Per my earlier e-mail, here is a copy of the actual paper reviewed and approved at the CCRG last week.

-----Original Message-----
From: Samaat, Syed (S.H.)
Sent: Friday, September 15, 2000 2:36 PM
To: Nana, Joseph (J.S.)
Cc: Loop, Jared (J.R.); McInerney, John (J.T.); Deering-Thornton, Zandr (Z.F.); Seashore, Patricia (P.J.); Samaat, Syed (S.H.)
Subject: CCRG - Wheel concern

Attached is the final version of the CCRG concern paper. I have included [redacted] and chnages made by you to the earlier version. This paper was reviewed with Pat Seashore. Please forward this to The CCRG committee for closure. Please call me regarding any questions you may have.

WHL_CCRG2.doc

REDACTED

DRAFT Sept. 13,2000

MODEL YEAR 1995-2000 WINDSTAR WHEEL CONCERN

To: CCRG Chairman
Subject: 1995-2000 Windstar Wheel Concern

CONCERN DESCRIPTION: Allegations of wheel nuts with insufficient torque and loose wheel studs/lugs on 1995-2000 Windstar vehicles were reported to the CCRG by Ford of Canada - FCSD.

CONCERN INVESTIGATION: The following data was investigated to assess this concern:
Field Data: (Approximately 1.5 Million vehicles were sold during 1995-2000)
(1) CQIS claims:
The indicator summary for 1995-2000 model years is as follows:
HDSR 11 wheel separated
CAC 33 wheel separated
NHL 6 wheel separated
Note: 21 out of 50 i.e 42% vehicles had wheels removed under warranty per AWS prior to incident
(2) AWS claims:
19 total claims of wheel separation were reported in AWS (cut-off date 6/30/00). Twelve (12) out of Nineteen (19) i.e. 63% confirmed instances where wheels were removed and reinstalled prior to separation.
(3) Accidents and injuries: Total Four (4) were reported, three (3) claims and 1 lawsuit which were closed.
(4) No assembly issues: The nut runner torque capability (CPk) was 1.4 –1.5 (Acceptable 3 Sigma is 1.33) between Jan.95 and Jan.00 using a pneumatic nut runner. A D.C nut runner has since been installed at Oakville Assembly Plant which increased the torque capability to 5 –11.
(5) No design or material defect issues: Review of Durability vehicle concerns for Model Years 1995-2001conducted with all past wheels Design and Release Engineers on durability vehicles indicate that no wheels separation concerns were ever reported during testing. Also, material analysis of parts returned from two vehicles in the field performed by Ford Central Laboratories indicates that the studs met all material specifications.
(6) Mileage study: The average mileage of all claims for wheel separation is 26,000 which is high enough to reasonably assume that tires were likely removed for tire rotation as part of routine maintenance.

ASSESSMENT OF EFFECT ON VEHICLE OPERATION:
The customer will notice vibration and/or steering wheel nibble if lug nuts are loosening. This condition would gradually increase as wheel lug-nuts nest elongates. If left unchecked, it may lead to breaking of wheel studs and possibly the wheel separating from the wheels.

RECOMMENDATION:
No field action required since engineering analysis indicates that the wheel design is robust and since the majority of the incidents of wheels separating occurred after the wheels were removed when servicing the vehicle the condition may be related to improper service and/or maintenance. Also, this investigation does not indicate a defect trend in the field. Based upon this information, Windstar OPD Chassis Engineering and NAC Safety/Recall Engineering recommends closure of this concern.

__Syed Hasan Sarmast (signed) 9/15/00
(Syed Sarmast) Date
Windstar OPD - Chassis

From:	Seashore, Patricia (P.J.)
Sent:	Monday, September 18, 2000 8:01 AM
To:	Heyde, Mary Ellen (M.E.)
Cc:	Sims, Michael (M.A.)
Subject:	FW: CCRG - Wheel concern

WHL_CCRG.doc

I will forward a copy of the 1-pager (I don't believe the attachment will come through). The recommendation is as follows:

No field action required since engineering analysis indicates that the wheel design is robust and since the majority of the incidents of wheels separating occurred after the wheels were removed when servicing the vehicle the condition may be related to improper service and/or maintenance. Also, this investigation does not indicate a defect trend in the field. Based upon this information, Windstar OPD Chassis Engineering and NAC Safety/Recall Engineering recommends closure of this concern.

This recommendation was reviewed and agreed to in CCRG last week,

-----Original Message-----
From: Sarmast, Syed (S.H.)
To: Neme, Joseph (J.S.)
Cc: Loop, James (J.R.); McInerney, John (J.T.); Deering-Thornton, Sandr (Z.F.); Seashore, Patricia (P.J.); Sarmast, Syed (S.H.)
Sent: 9/15/00 2:35 PM
Subject: CCRG - Wheel concern

Attached is the final version of the CCRG concern paper. I have included and chnages made by you to the earlier version. This paper was reviewed with Pat Seashore.
Please forward this to The CCRG committee for closure. Please call me regarding any questions you may have. <<WHL_CCRG2.doc>>

REDACTED

D R A F T Sept. 13,2000

MODEL YEAR 1995-2000 WINDSTAR WHEEL CONCERN

To: CCRG Chairman
Subject: 1995-2000 Windstar Wheel Concern

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__Syed Hasan Sarmast (signed) 9/15/00
(Syed Sarmast) Date
Windstar OPD - Chassis

From:	Sarmast, Syed (S.H.)
Sent:	Friday, September 15, 2000 2:36 PM
To:	Name, Joseph (J.S.)
Cc:	Loop, James (J.R.); Molnarney, John (J.T.); Deering-Thornton, Zandr (Z.F.); Seashore, Patricia (P.J.); Sarmast, Syed (S.H.)
Subject:	CCRG - Wheel concern

Attached is the final version of the CCRG concern paper. I have included and chnages made by you to the earlier version. This paper was reviewed with Pat Seashore.
Please forward this to The CCRG committee for closure. Please call me regarding any questions you may have.

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__Syed Hasan Sarmast (signed) 9/15/00
(Syed Sarmast) Date
Windstar OPD - Chassis

From: Nema, Joseph (J.S.)
Sent: Tuesday, September 05, 2000 6:26 PM
To: Seashore, Patricia (P.J.)
Subject: Windstar Wheel CCRG ITem

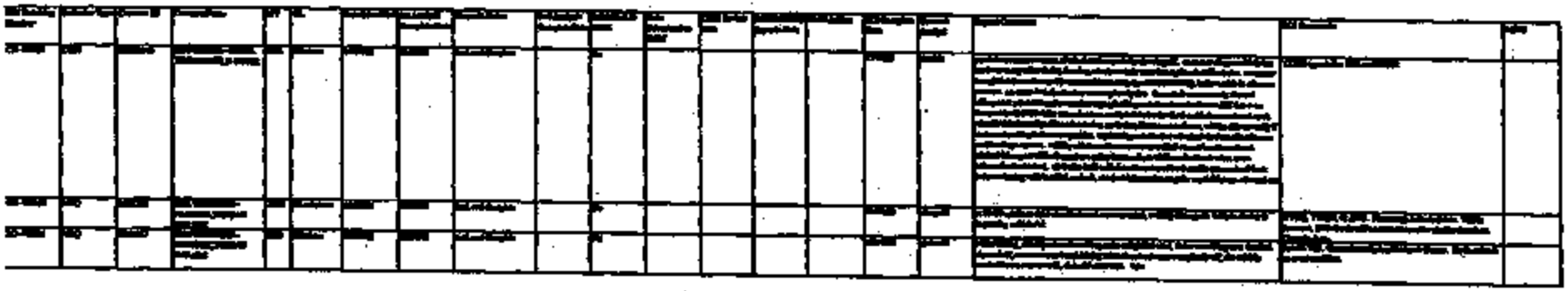
Pat... If we are closing this item, we need to do so at next Tuesday's CCRG meeting to avoid the lateness of the 90 day metric from going to Chris T and RPJ. Syed completed his warranty search and there appears to be no trend but we need him to check repair history on the vehicles to see if the wheels were removed prior to the incidents. I talked with Syed earlier today and we plant to sit down with you on Friday.

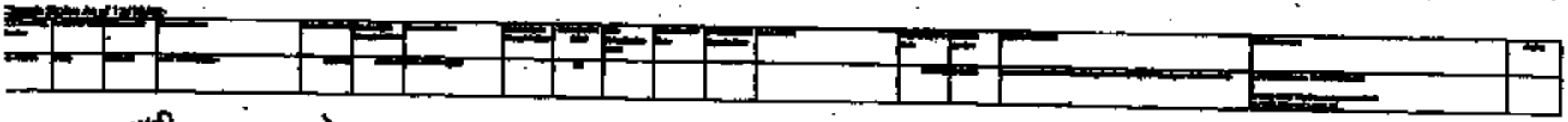
Joe Nema
NAC - Safety/Recalls
Phone: 39-06133; Fax: 39-06002; Cube: Bldg #1, 1GB25

WINDSTAR ONLY

ECI Tracker Reports Referencing Wheel Lug Nuts and/or Studs

Search Words: Wheel, Lug, Nut and Studs

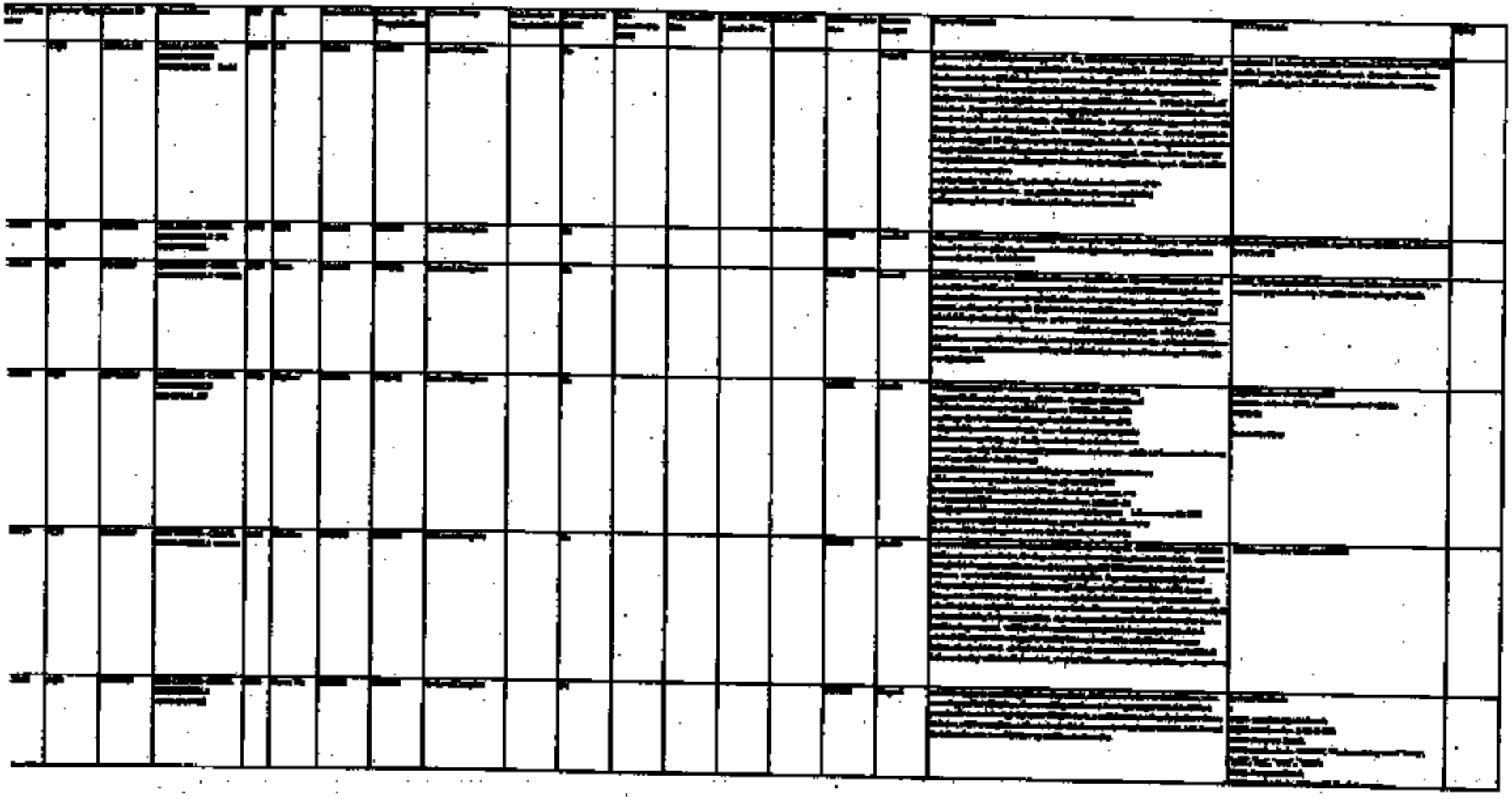




MUST show one in service w/ wheel stud & wheel nut!

ECI Tracker Bepods Referencing Wheel Lug Nuts and/or Studs

[redacted]



ECI Tracker Reports Referencing Wheel Lug Nuts and/or Studs

Search Words: Wheel, Lug, Nut and Studs

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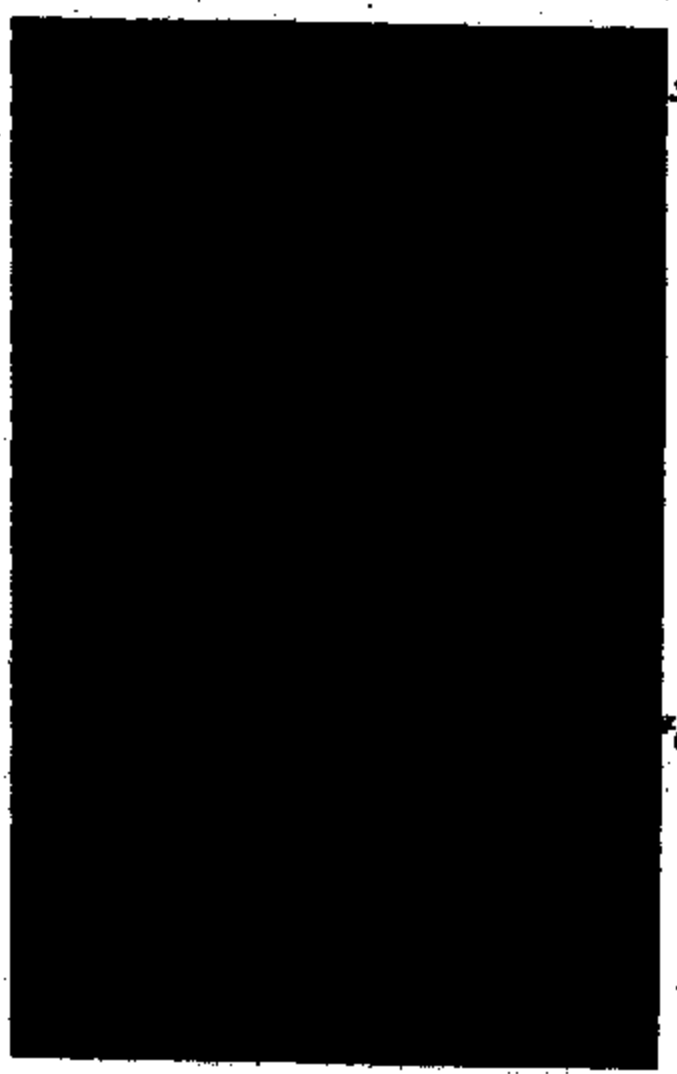
SCI Member Reports Referencing Wheel Lug Nuts and/or Studs

Search Words: Wheel, Lug, Nut and Stud

ODI No	Model Yr	Vin	Miles	Summary	Failure Date	Date of Letter
781573	1998		0	MISSING OR IMPROPERLY ADJUSTED LUG NUTS ARE A FACTORY PROBLEM ON 1998 UNITS MANUFACTURED IN CANADA.		8-Jun-99
544610	1998	2FMDA5[illegible]40WBB36463	30000	VIBRATION FROM REAR DRIVERS SIDE WHEEL DUE TO 4 LUG NUTS FALLING OFF WHEEL, WHEEL WAS BEING SECURED BY 1 LOOSE LUG NUT.	5-Mar-99	5-Apr-99
539559	1998	2FMDA514WB[redacted]	52000	WHILE DRIVING AT 70 MPH 2 LUGS: NUTS CAME OFF, AND THE CONSUMER HAD TO PULL OVER TO THE SIDE OF THE ROAD. CONSUMER TOOK OFF THE HUB CAP AND NOTICED THAT TWO OF THE LUGS: NUTS CAME OFF, AND THE OTHER THREE WERE COMING OFF. THE STUDS SHEARED OFF INSIDE THE LUG NUTS. *AK	27-Mar-99	5-Apr-99
545785	1998		0	LUG NUTS BROKE OFF OF RIGHT FRONT TIRE AND HUB OF WHEEL/BRAKE DRUM, RESULTING IN TIRE FALLING OFF OF VEHICLE AND CAUSING DAMAGE TO VEHICLE. (OHIO TRAFFIC CRASH REPORT). MJS	5-Apr-99	25-May-99
715402	1998	2FMZA5149WB[redacted]	44000	1)ALL 5 LUGS: NUTS SHEARED OFF FROM THE RIGHT FRONT PASSENGER HUB, CAUSING THE WHEEL TO LEAVE THE VEHICLE. THE BODY OF THE VEHICLE TRAVELED APPROXIMATELY 200 FEET UNTIL IT STOPPED. 2)THE REAR BRAKES HAD TO BE REPLACED WITH NEW PADS AND ROTORS. DEALER COULDN'T EXPLAIN WHY THIS WAS A PROBLEM. 3) THE NEXT DAY THE RIGHT PASSENGER MIRROR ELECTICAL SYSTEM NO LONGER WORKED. 4)THE PARKING BRAKE CONSISTENTLY DOES NOT DISENGAGE AFTER USE. WE NO LONGER USE IT, POSSIBLY CREATING A SAFETY HAZARD. 5) THE VEHICLE INTERMITTENTLY STALLS OUT AT LOW SPEEDS OR UPON STOPPING. ADDITIONALLY THE INITIAL GEARS SHIFT HARD AND LOUD. 6) THE REAR SEAT WILL NOT MOVE ON THE TRACK. *AK	23-Nov-99	23-Nov-99
668265	1998	2FMDA5140WB[redacted]	0	THE LEFT WHEEL LUGS: NUTS BROKE OFF OR SHEARED OFF WHICH MAY CAUSE THE WHEEL TO FALL OFF. OCCURRED TWICE. PLEASE PROVIDE FURTHER INFORMATION. *AK	1-Apr-99	21-Jan-00
717738	1998	2FMDA5141WB[redacted]	41000	MY WIFE WAS TURNING LEFT AT A RED LIGHT AND WAS WAITING FOR PEDISTRIANS TO CROSS THE STREET. AS SHE TURNED THE CORNER THE RIGHT FRONT TIRE SNAPPED OFF OF THE HUB AND ALMOST HIT A LAWYER ALL FIVE OF THE STUDS BROKE OFF, THE METAL INDICATED THEY WERE FRESH BREAKS. THERE WAS NOT ANY INDICATION OF THE NUTS BEING LOSE, THE NUTS WERE STILL SCREWED ON THE STUDS. THE WHEEL AND NUTS DID NOT LOOK SCARED AS IF THEY HAD BEEN LOSE. PIOR TO THE WHEEL COMING OFF THERE HAD BEEN NO SHIMMY OR VIBRATION AT ALL. I HAD DRIVEN THE VEHICLE THE PREVIOUS NIGHT AND HAD NOT FELT ANYTHING OUT OF THE ORDINARY. SHE HAD ONLY ACCELERATED FROM THE LEFT TURN POSITION ABOUT 15FT AND COULD NOT HAVE BEEN GOING FASTER THAN 5 MPH. THE VEHICLE HAD NOT BEEN SERVICED AFTER WE PURCHASED IT. THANK GOD SHE WAS NOT ON THE INTERSTATE IN 5'OCLOCK TRAFFIC! *AK	21-Jan-00	28-Jan-00

857486	1998	PASSENGER'S SIDE FRONT TIRE BOLTS SHEARED OFF AND WHEEL ROLLED DOWN THE HIGHWAY. CAR RESTED ON FRONT DISC BRAKE. THEN IT CAME TO A STOP. MECHANIC SAID 37000 THE BOLTS BROKE OFF, AND NUTS WERE STILL ON THEM. *AK	5-Jan-00	24-Feb-00	
868605	1999 2FMZA5147XB[redacted]	WAS MAKING A LFET TURN RIGHT FRONT PASSENGER'S WHEEL FLEW OFF. THIS WAS CAUSED BY 5 OF THE WHEEL BOLTS BREAKING OFF IN HALF. IT MADE A LOUD BOOM & THEN A BANG TYPE OF NOISE. CONTACTED FORD & INFORMED NOT THEIR FAULT & WILL NOT PAY FOR 19 REPAIRS. *AK	9-Mar-00	19-Apr-00	ECT NOT ACTIVE
883590	2000	WHILE DRIVING WHEELS ON RIGHT FRONT PASSENGER'S SIDE CAME COMPLETELY OFF. ALL LUGSNUTS WERE BROKEN WITH NO SIGN OF WEAR AND TEAR. VAN WAS TOWED TO 0 DEALERSHIP. PLEASE PROVIDE ANY FURTHER INFORMATION.*AK	16-Jun-00	14-Jun-00	ECT NOT ACTIVE
884099	1999 2FMZA5146XB[redacted]	CONSUMER WAS A THE STOP LIGHT AND WHILE TURNING RIGHT FRONT PASSENGER'S WHEEL FELL OFF. VEHICLE WAS TOWED TO THE DEALERSHIP. MECHANIC TOLD CONSUMER THAT 10700 WHEEL LUGS; NUTS WERE TOO TIGHT, AND ALL FIVE WERE SEVERED.*AK	2-Jun-00	22-Jun-00	ECT NOT ACTIVE
873132	1998 2FMZA5146WB[redacted]	WHILE DRIVING AT 70 MPH FRONT RIGHT WHEEL LUGS SHEARED OFF CAUSING WHEEL TO	8-Nov-99	17-Oct-00	
876723	1998 2FMZA5143WB[redacted]	30400 COME OFF.*AK *SLC	5-Oct-99	19-Dec-00	
		32000 FRONT WHEEL BOLTS FELL OFF, AND TIRE CAME OFF. *AK			
885709	1998 2FMZA5143WB[redacted]	LEFT FRONT WHEEL LUG BOLTS SHEARED OFF CAUSING THE TIRE AND WHEEL TO COME OFF 32500 AND HIT ANOTHER VEHICLE. CONSUMER REQUESTS REIMBURSEMENT. *SLC	20-Oct-00	12-Jan-01	
885709	1998 2FMZA5143WB[redacted]	LEFT FRONT WHEEL LUG BOLTS SHEARED OFF CAUSING THE TIRE AND WHEEL TO COME OFF 32500 AND HIT ANOTHER VEHICLE. CONSUMER REQUESTS REIMBURSEMENT. *SLC	20-Oct-00	12-Jan-01	
740949	1998 2FMZA5140WB[redacted]	MY CONCERN IS WHY ALL FIVE STUDS THAT HOLD THE WHEEL ON BROKE AT ONCE, RESULTING IN LOSE OF STEERING. THE BODY SHOP AND THE INSURANCE AGENT COULD OFFER NO GOOD REASON FOR THIS FAILURE, THEY SAID MAYBE THE LUG NUTS WERE OVER TIGHT. NOW IM CONCERN ABOUT IT HAPPENING AGAIN TO ANOTHER WHEEL IF SOMETHING IS 0 DIFFERENT. *AK	7-Feb-01	19-Feb-01	
[redacted]					ECT NOT ACTIVE
[redacted]					ECT NOT RECEIVED USED DATA NOT Inspec

1999 VW-GMB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From:	Marin, Nick (N.)
Sent:	Tuesday, November 07, 2000 7:29 AM
To:	Samaak, Syed (S.H.)
Cc:	Mahoney, John (J.T.); Nama, Joseph (J.S.)
Subject:	MY '99WINDSTAR KEEPS BREAKING FRONT WHEEL STUDS

IT SEEMS THAT YOU ARE AWARE OF MY PROBLEMS. BACK IN JULY/2000 LALLY FORD IN TILBURY REPAIRED MY VAN WHEN ALL 5 STUDS ON THE RH FRONT WHEEL WERE TORN OFF. THEY SENT YOU A COPY OF THE REPAIR BILL OR AT LEAST THEY INFORMED YOU ABOUT THE PROBLEM. SOON AFTER THE REPAIR WAS DONE I GAVE ALL THE REMAINERS OF THE STUDS AND THE RIM TO JOE NEME FOR TESTING. HAVE YOU DONE ANY TEST ON THEM ? WHAT DO YOU THING WOULD BE THE PROBLEM ?
AN ANSWER FROM YOU WOULD BE GREATELY APPRECIATED. THANK YOU.

[redacted]

From: [redacted]
Sent: Friday, October 27, 2000 6:54 AM
To: Neme, Joseph (J.S.)
Subject: Windstar Broken Studs Test

Hi Joe,
I hope you remember me. Early last August I came to your office and gave you the remainers of the 5 studs and the rim from my '99 WINSTAR. They broke while I was driving and the wheel fell off. Would you, please tell me if you did any test on those studs and what was the result of the test?

Thank you
[redacted]

From: [redacted]
Sent: Thursday, November 23, 2000 7:31 AM
To: Nema, Joseph (J.S.)
Cc: McInerney, John (J.T.)
Subject: RE: this is second time the wheel fell off.

Thank you for the note, Joe.

As you know it's been two weeks since the van was fixed and so far no problems. Next week I will go to Moe Campbell for a check up on that wheel.Hope everything will be fine. I am, still, very eager to find out the results of the lab test.
Once again, Thank you.

[redacted]

----Original Message----
From: Nema, Joseph (J.S.)
Sent: Wednesday, November 22, 2000 4:49 PM
To: [redacted]
Cc: McInerney, John (J.T.); Seashore, Patricia (P.J.); Samaan, Syed (S.H.); Burrow, Carl (C.H.); Goering, Kimberly (K.L.)
Subject: FW: this is second time the wheel fell off.

[redacted]

Engineering is concerned when they hear of a condition like the one you originally expressed last summer when the wheel came off your vehicle. Unfortunately, you did not get timely response back on what all happened after your initial contact. Hopefully this note will help you understand some other items that were done regarding your concern.

As you recall, immediately after you notified the PVT manager I sent you an e-mail to get specific information on your vehicle so that I can present your concern to the Critical Concern Review Group (CCRG). This group was established to review potentially critical customer concerns and is chaired by the Automotive Safety Office and includes personnel from Engineering, Vehicle Operations, Research, Legal, and Customer Service. I presented your concern to the committee on the Tuesday following your original notification and you were contacted by my engineer John who made arrangements to meet with you to get the parts off your vehicle. This group takes all concerns very seriously!

Based on the data you provided, you were also informed of the proper torque specification for lug nuts on your vehicle.

All corporate data bases were searched for other similar concerns on all 1995-2001 Windstars not just the model year of your vehicle. Based on a thorough review of all the data bases, it was determined by the committee that there is not a trend of wheel seperation on Windstar vehicles.

Parts from your vehicle were also sent to the materials lab for analysis and as you know, engineering has not received a report out from the lab yet. As John told you, results from this analysis will be provided to you when available.

You second incident was a concern to us as it was to you and that is why I sent John and Syed to look at your vehicle to see if there is something uniquely different with your vehicle compared to others. At the review, it was discovered that the wheel on your vehicle that was repaired and replaced by a Ford Dealership had witness marks on the back side that may indicate that it was not sitting properly on the rotor/hub. We removed the parts and are bring them back to see if the same witness marks exist on your original wheel to help determine where they may of come from. John may be contacting you to look at your vehicle again if that

wouldn't be too much of an imposition.

May I suggest that you use John and me as your contacts on this item. I understand that notes and requests for information have gone to many different areas. Unfortunately instead of helping to get you a good response, this has added confusion.

----Original Message----
From: [redacted]
Sent: Wednesday, November 15, 2000 1:00 PM
To: Seashore, Patricia (P.J.)
Cc: McInerney, John (J.T.); Samaat, Syed (S.H.); Kumrow, Carl (C.H.); Neme, Joseph (J.S.)
Subject: RE: this is second time the wheel fell off.

Am I satisfied how the whole problem was handle ? Definitely NOT. Why ?
1. First time it happened, NOBODY paid any attention to me. Was'n it a serious enough safety incident to have somebody looking into it ? Nobody din not even bother answering my E mail. After they repaired the minivan and I paid for it Joe Neme ask me for the parts to do some tests on them. Results... Nobody knows, yet !!!
2. Second time , after two weeks of silence John McInerney was the only person to answer my calls and he actually did something for me. Syed Samaat did come with John to see the problem, but the way he tried to solve the problem was not appropiate at all. Oh, you've got a broken stud ? We give some new parts and we get rid of you. You are not the only problem we have. I showed him wat I think was the problem and he blamed Lally Ford for not fixing it right the first time. Any tests done on the parts ? Who knows !
When I finally talked to Karl Kumrow he said ," yes, I got your E mail and this may be your priority but I got 1000 of other priorities." What shoud I say to such an answer?
Patricia, I am a Ford Motor Company employee and I hoped that with the way we can communicate would be easy for me to explain to the right people what happened. But it looks like just about everybody choose to "click DELETE," and ignore me.
How about the rest of the people who buy Ford vehicles ? Do you choose to ignore them, as well ?
I was LUCKY TWICE. If that wheel would fall off on the highway me and my family would be history now. Do you need to have some DEAD people in order to look at this kind of problems ? Isn't this a serious enough safety issue worth of looking into ?
Windstar minivan is supposed to be one of the safetyest FAMILY vehicle on the road. Is this how you show you concern for the customer SAFETY and SATISFACTION ? Shoud I recomend this vehicle to somebody else ?
To answer your last question . Yes, at 1000Km after repair I will go to the dealer for a check up.

[redacted]

----Original Message----
From: Seashore, Patricia (P.J.)
Sent: Wednesday, November 15, 2000 6:56 AM
To: [redacted]
Subject: FW: this is second time the wheel fell off.

I was obviously not aware of all the background on your vehicle; that it had happened previously and that you had been doing work on the vehicle. Saftey is my top concern, as well as reassuring you that we are concerned about customer satisfaction for all. One of the engineers in my group met with you last week, Syed Samaat. Are you pleased with the assistance you received from Syed? Do we have some follow up steps in place with you or do we need to add some?

Patricia J. Seashore
Bldg. 1 11F021 Phone: 313-32-36585
Windstar/Villager Chassis Manager
Lifestyle Vehicles Brakes/Tires/Wheels/Steering Chassis Manager

----Original Message----
From: [redacted]
Sent: Wednesday, November 01, 2000 7:30 AM

To: Seashore, Patricia (P.J.)
Cc: Kumrow, Carl (C.H.)
Subject: RE: this is second time the wheel fell off.

Pat, this is not the first time the RH side front wheel tear down the studs. First time it happened in JULY/2000. At that time I was comming from work and the wheel came off COMPLETELY TEARING OFF ALL 5 STUDS. I had about 29000Km on board at that time.I sent notes to CARL K. and some other people but nobody paid any atention to me. Everybody blaimed me FOR ROTATING THE TIRE MYSELF AT 9400Km.So, after driving the vehicle for another 20000Km the wheel fell off because of me.Lally Ford in Tilbury (Ford dealer where I bought the vehicle) REPAIRED THE MINIVAN WITH THEIR CERTIFIED TECHNICIANS and I paid for it.($ 1700.)Here we no speak 100000Km AND THREE MONTH LATER THE EXACTLY SAME WHEEL DOES THE SAME THING AGAIN. Within these three month I did not do anything to the vehicle.Am I the SCAPE GOAT again? This would be an easy way out. Pat, WOULD YOU DARE TO TAKE YOUR FAMILY FOR A DRIVE ON THE HIGHWAY IN THIS VEHICLE ?

Thank you for paying attention,
[redacted]

----Original Message----
From: Seashore, Patricia (P.J.)
Sent: Tuesday, October 31, 2000 2:45 PM
To: [redacted] Kumrow, Carl (C.H.)
Cc: Jathurun, David (D.R.)
Subject: FW:

[redacted]- I asked Carl Kumrow to follow up and obtain additional information from you regarding the service that had been done to your Windstar. Have you ever had the wheels removed for any kind of service? If so, when?

----Original Message----
From: Seashore, Patricia (P.J.)
Sent: Friday, October 27, 2000 11:41 AM
To: Kumrow, Carl (C.H.)
Cc: Samaat, Syed (S.H.); Loop, James (J.R.); Maraby, Sharif (S.); Jathurun, David (D.R.); Hatzis, Bill (B.)
Subject: RE:

Carl: please have the OAP FCSD PVT rep research this vehicle and determine what service has been done to it -- specifically if the wheels have ever been removed. If the answer is yes, then we can only assume it was improperly serviced (under or over torqued).

----Original Message----
From: Kumrow, Carl (C.H.)
Sent: Friday, October 27, 2000 11:36 AM
To: Seashore, Patricia (P.J.)
Cc: Samaat, Syed (S.H.); Loop, James (J.R.); Maraby, Sharif (S.); Jathurun, David (D.R.); Hatzis, Bill (B.)
Subject: FW:

I think that someone should look at this specific vehicle.

----Original Message----
From: Marin, Nick (N.)
Sent: Friday, October 27, 2000 11:16 AM
To: Jathurun, David (D.R.)
Cc: Kumrow, Carl (C.H.); Lang Dr., Juergen (J.K.); Pilasunow, Stanislav (S.I.); Porter, Dave (D.); Traynor, Greg (G.P.); Zabat, Mark (M.)
Subject:

GENTLEMEN, I NEED YOUR HELP. PLEASE, READ MY ATTACHMENT.
THANK YOU
[redacted] << File: '99 WINDSTAR.doc >>

From: Mcinerney, John (J.T.)
Sent: Tuesday, November 14, 2000 7:34 AM
To: [redacted]
Cc: Nema, Joseph (J.S.); Sarmast, Syed (S.H.); Mcinerney, John (J.T.)
Subject: RE: broken stude test

'morning Nick, I dropped your tire/wheel off at noon on thurs, came back to drive to Chicago area on other company stuff. Back at 2AM Saturday morn, off to Phoenix Sunday at 7PM, just got off the "red eye" at 5:45AM this morning! Havent had time to check ANYTHING. How bout you Syed?

-----Original Message-----
From: [redacted]
Sent: Monday, November 13, 2000 9:33 AM
To: Nema, Joseph (J.S.); Sarmast, Syed (S.H.); Mcinerney, John (J.T.)
Subject: broken stude test

Good morning gentlemen,
Any news on the test of the broken stude from my '99 WINDSTAR ?

From: [redacted]
Sent: Friday, November 03, 2000 11:20 AM
To: Neme, Joseph (J.S.)
Cc: McInerney, John (J.T.)
Subject: RE: '99 windstar broken studs test

Joe,

Thank you very much for answering. I am on light duty right now (broken leg in august) so I am steady days for another 4 weeks. Whenever your engineer is available ll will be there to show him the van.

John,

I hope you receive this message as well, please let me know when you or your man is available. E-mail me, or call me at [redacted]. Page me at [redacted]

Thanks to both of you,

[redacted]

----Original Message----
From: Neme, Joseph (J.S.)
Sent: Friday, November 03, 2000 10:03 AM
To: [redacted]
Cc: McInerney, John (J.T.)
Subject: FW: '99 windstar broken studs test

[redacted]

I was out of the office when you sent the letter and my e-mail should of notified you. I spoke with one of our engineers this morning and just learned that you had another incident with your wheel at the same vehicle position. I want to have the engineers look at your vehicle at the dealership. They may want to take back some parts for analysis. Do you still work the midnight shift? What dealership/time works best for you next week? Please let John McInerney know so he can work out the details with the dealership and the wheel engineer... thanks

----Original Message----
From: [redacted]
Sent: Tuesday, October 31, 2000 6:57 AM
To: Neme, Joseph (J.S.)
Subject: '99 windstar broken studs test

Joe, I did sent you a message last week regarding the result of the broken studs from my '99WINDSTAR.
DID YOU RECEIVE IT? AN ANSWER WOULD BE VERY MUCH APPRECIATED.

Thank you

[redacted]

Article No. 98-5A-4	• BRAKES—PREVENTING BRAKE VIBRATION—SERVICE TIP • WHEELS—PROPER LUG TORQUE PROCEDURES—SERVICE TIP

FORD: 1972-97 THUNDERBIRD
1975-86 LTD
1976-97 MUSTANG
1981-97 CROWN VICTORIA
1982-98 EXP
1982-98 ESCORT
1984-94 TEMPO
1986-97 TAURUS
1986-93 FESTIVA
1989-97 PROBE
1994-97 ASPIRE
1995-98 CONTOUR

LINCOLN-MERCURY: 1979-93 MONARCH, ZEPHYR
1979-97 COUGAR
1980-83 MARK VI
1980-98 CONTINENTAL, TOWN CAR
1981-86 LYNX
1983-86 MARQUIS
1984-92 MARK VII
1984-94 TOPAZ
1986-97 SABLE
1987-89 TRACER
1987-97 GRAND MARQUIS
1991-94 CAPRI
1991-97 TRACER
1993-98 MARK VIII
1995-98 MYSTIQUE

LIGHT TRUCK: 1978-96 BRONCO
1979-97 ECONOLINE, F-150-350 SERIES
1984-90 BRONCO II
1984-97 RANGER
1986-97 AEROSTAR
1986-97 F SUPER DUTY
1991-97 EXPLORER
1993-97 VILLAGER
1995-98 WINDSTAR

• BRAKES—PREVENTING BRAKE VIBRATION—SERVICE TIP • WHEELS—PROPER LUG TORQUE PROCEDURES—SERVICE TIP	Article No. 98-5A-4 Cont'd.

1997 EXPEDITION
1998 NAVIGATOR

ISSUE: The use of air impact tools to tighten wheel lug nuts can lead to overtightened and/or unevenly tightened wheel lug nuts. Air impact tools typically used for wheel lug nut removal and installation can generate up to 475 N•m (350 lb-ft) of torque. Overtightened and/or unevenly torqued wheel lug nuts may cause:

- Brake vibration
- Distortion of the wheel hub
- Distortion of the brake rotor
- Brake rotor runout
- Damage to the wheel
- Damage to the wheel nuts and studs

ACTION: All wheel lug nuts should only be tightened to specification using a torque wrench or by using the Rotunda ACCUTORQ 164-R0314 or equivalent on a 1/2" drive air impact tool. The "ACCUTORQ" lug nut sockets limit the torque of the air impact tool, preventing overtightening or uneven tightening of the wheel lug nuts. The torque limiting devices (regulators) on air impact tools will not reduce the output torque enough to prevent overtightening of the wheel lug nuts.

NOTE: REFER TO THE APPROPRIATE SERVICE MANUAL OR THE CHART IN FIGURE 1 FOR THE CORRECT WHEEL LUG NUT TORQUE SPECIFICATION. THE CHART IN FIGURE 1 ALSO PROVIDES THE CORRECT "ACCUTORQ" LUG NUT SOCKET TO USE.

The "ACCUTORQ" socket is intended for lug nut installation, not removal. When using the "ACCUTORQ" socket, the output torque of the air impact tool must be set to 217-339 N•m (160-250 lb-ft), usually this will be the lowest setting on the air impact tool.

The "ACCUTORQ" lug nut sockets are available through Rotunda Equipment. The four-piece set (164-R0314) fits most Ford Motor Company cars and light trucks. The tool set consists of four (4) lug nut sockets and a storage case. The set can be ordered by calling Rotunda Equipment at 1-800-ROT-UNDA (768-8632).

CAUTION: AIR IMPACT TOOLS SHOULD NOT BE USED TO TIGHTEN WHEEL LUG NUTS UNLESS THE "ACCUTORQ" LUG NUT SOCKET OF THE CORRECT SPECIFICATION IS USED.

NOTE: DO NOT USE AIR IMPACT TOOLS ON LOCKING WHEEL LUG NUTS. THEY ARE TO BE HAND-TORQUED ONLY.

OTHER APPLICABLE ARTICLES: NONE
SUPERSEDES: 97-17-6
WARRANTY STATUS: INFORMATION ONLY
OASIS CODES: 301000, 303000, 306000

ACCUTORQ SOCKETS

VEHICLE	YEAR	SIZE	LB-FT TORQUE	TOOL COLOR
FORD				
Aspire	1994-97	21mm	80	Light Brown
Contour	1995-98	18mm-3/4"	100	Gray
Crown Victoria	1991-97	13/16"	100	Dark Brown
Escort ZX2	1998	21mm	80	Light Brown
Escort	1991-96	21mm	80	Light Brown
Escort	1997-00	18mm-3/4"	100	Gray
ESP	1997-98	18mm-3/4"	100	Gray
Festiva	1988-96	21mm	80	Light Brown
Georgia	1978-82	13/16"	100	Dark Brown
LTD	1978-86	13/16"	100	Dark Brown
Mustang	1979-97	13/16"	100	Dark Brown
Probe	1989-97	21mm	80	Light Brown
Taurus	1986-97	18mm-3/4"	100	Gray
Tempo	1984-94	18mm-3/4"	100	Gray
Thunderbird	1997-97	18mm-3/4"	100	Gray
Thunderbird	1978-88	13/16"	100	Dark Brown
LINCOLN				
All Models	1988-98	13/16"	100	Dark Brown
MERCURY				
Capri	1991-94	21mm	80	Light Brown
Capri	1979-88	13/16"	100	Dark Brown
Cougar	1997-97	18mm-3/4"	100	Gray
Cougar	1979-88	13/16"	100	Dark Brown
Lynx	1991-98	18mm-3/4"	100	Gray
Marquis	1988-98	13/16"	100	Dark Brown
Mystique	1995-98	18mm-3/4"	100	Gray
Monarch, Zephyr	1979-98	13/16"	100	Dark Brown
Sable	1986-97	18mm-3/4"	100	Gray
Topaz	1984-94	18mm-3/4"	100	Gray
Tracer	1991-97	21mm	80	Light Brown
Tracer	1997-98	21mm	80	Light Brown
Grand Marquis	1997-97	18mm-3/4"	100	Gray
LIGHT TRUCK				
E-150/F-150	1979-97	13/16"	100	Dark Brown
BF-550/555	1999-97	7/8"	140	Turquoise
BF-550/555 (Dual Rear)	1994-97	7/8"	140	Turquoise
F-Super Duty	1999-97		140	N/A
Aerostar	1986-97	18mm-3/4"	100	Gray
Bronco	1979-96	13/16"	100	Dark Brown
Bronco II	1984-90	18mm-3/4"	100	Gray
Courier	1979-93	21mm	80	Black
Explorer	1991-97	13/16"	100	Dark Brown
Ranger	1994-97	18mm-3/4"	100	Gray
Windstar	1995-98	13/16"	100	Dark Brown
Villager	1999-97	21mm	80	Light Brown
Expedition	1997	18mm-3/4"	100	Gray
Navigator	1998	18mm-3/4"	100	Gray

TB-4100-0

Figure 1 - Article 88-5A-4

http://tsc.m.ford.com/tsb/96/971706.htm

TSB Article Number: 97-17-6

Brakes - Preventing Brake Vibration - Service Tip

Wheels - Proper Lug Torque Procedures - Service Tip

http://tsc.wc.ford.com/tsb/96/971706.htm

FORD:	1972-1997	THUNDERBIRD
	1976-1997	CROWN VICTORIA, MUSTANG
	1982-1998	ESCORT
	1984-1994	TEMPO
	1986-1997	TAURUS
	1988-1993	FESTIVA
	1989-1997	PROBE
	1994-1997	ASPIRE
	1995-1998	CONTOUR
LINCOLN-MERCURY:	1979-1997	COUGAR
	1980-1998	CONTINENTAL, TOWN CAR
	1981-1986	LYNX
	1983-1986	MARQUIS
	1984-1992	MARK VII
	1984-1994	TOPAZ
	1986-1997	SABLE
	1987-1989	TRACER
	1987-1997	GRAND MARQUIS
	1991-1994	CAPRI[SPC]
	1991-1997	TRACER
	1993-1998	MARK VIII
	1995-1998	MYSTIQUE
LIGHT TRUCK:	1979-1996	BRONCO
	1979-1997	ECONOLINE, F-150-350 SERIES
	1984-1990	BRONCO II
	1984-1997	RANGER
	1986-1997	AEROSTAR
	1988-1997	F SUPER DUTY
	1991-1997	EXPLORER
	1993-1997	VILLAGER
	1995-1998	WINDSTAR
	1997-1997	EXPEDITION
	1998-1998	NAVIGATOR

This TSB article is being republished in its entirety to update the applicable models and years, and also expand the Issue.

ISSUE: The use of air impact tools to tighten wheel lug nuts can lead to overtightened and/or unevenly tightened wheel lug nuts. Air impact tools typically used for wheel lug nut removal and installation can generate up to 475 N.m (350 lb-ft) of torque. Overtightened and/or unevenly torqued wheel lug nuts may

http://tsb.ws.ford.com/tsb/96/971706.htm

cause:

- Brake vibration
- Distortion of the wheel hub
- Distortion of the brake rotor
- Brake rotor runout
- Damage to the wheel
- Damage to the wheel nuts and studs

ACTION: All wheel lug nuts should only be tightened to specification using a torque wrench or by using the Rotunda ACCUTORQ 164-R0314 or equivalent on a 1/2" drive air impact tool. The "ACCUTORQ" lug nut sockets limit the torque of the air impact tool, preventing overtightening or uneven tightening of the wheel lug nuts. The torque limiting devices (regulators) on air impact tools will not reduce the output torque enough to prevent overtightening of the wheel lug nuts.

NOTE: REFER TO THE APPROPRIATE SERVICE MANUAL OR THE CHART IN FIGURE 1 FOR THE CORRECT WHEEL LUG NUT TORQUE SPECIFICATION. THE CHART IN FIGURE 1 ALSO PROVIDES THE CORRECT "ACCUTORQ" LUG NUT SOCKET TO USE.

The "ACCUTORQ" socket is intended for lug nut installation, not removal. When using the "ACCUTORQ" socket, the output torque of the air impact tool must be set to 217-339 N.m (160-250 lb-ft), usually this will be the lowest setting on the air impact tool.

The "ACCUTORQ" lug nut sockets are available through Rotunda Equipment. The four-piece set (164-R0314) fits 95% of all Ford Motor Company cars and light trucks. The tool set consists of four (4) lug nut sockets and a storage case. The set can be ordered by calling Rotunda Equipment at 1-800-ROT-UNDA (768-8632).

CAUTION: AIR IMPACT TOOLS SHOULD NOT BE USED TO TIGHTEN WHEEL LUG NUTS UNLESS THE "ACCUTORQ" LUG NUT SOCKET OF THE CORRECT SPECIFICATION IS USED.

NOTE: DO NOT USE AIR IMPACT TOOLS ON LOCKING WHEEL LUG NUTS. THEY ARE TO BE HAND-TORQUED ONLY.

Other Applicable Articles: NONE
Supersedes: 95-6-4
Warranty Status: Information Only

OASIS CODES: 301000, 303000, 306000

Figure 1 - Article 97-17-6

FCSD Field Quality Engineer (FQE) Request

Complete the FQE Support Request section of the form below (green headers).
If you have questions, contact Maria Lovelace (Mlovela1 323-6561)
After the form is completed, save it on your hard drive and send via E-mail to: Maria Lovelace

FCSD FQEs are trained engineers, familiar with all subsystems and vehicles. They visit dealership Service Departments and other Ford and Lincoln-Mercury service locations and fleets daily. FQEs can provide the following support services: Inspect vehicles for specific conditions; take photographs; recover and return failed components; locate vehicles for testing and/or inspection by other engineering personnel; perform test drives and record results.

Model Year(s) 1998/1999/2000	Requestor's Name N. Villarreal
Vehicle line(s) Windstar	Phone Number 313-322-7986
Mileage range All	Email Address NVILLARR
Part number(s)	Pictures/CQIS Reports? NR
Date Issued May 21, 2003	Due Date ASAP

Geographic or Climatic Concern?	All geographic areas
What specific information do you want recorded (measurements, etc.)?	Record Mileage and VIN Use LG-4 to cover dealer cost of replacement.

NHTSA is conducting an investigation into Windstar wheel lug nut breakage. To assist in Ford Engineering investigation, please obtain the following components from the field.
Place priority on vehicles built in May/June of 1997.

Obtain five (5) sets of the following parts from each of the model year (97-99) listed above:

1) Wheel assemblies' - 15 inch aluminum. Fronts only
   -1998 F7BA-1007-BD (15x6.0 Aluminum wheel)
   -1999/2000 XF2a-1007-CC (15 x 6.5 Aluminum Wheel)
2) Front rotors – (base part 1125)
3) Front hub and bearing assy (1104)
4) Lug nuts

Tag all parts with side removed (LH, RH) and with corresponding VIN.
Ship parts to attention:

Six Sigma Center
15080 Commerce Drive North
Dearborn, MI 48129
Attn: N. Villarreal 322-7986 or Syed Sarmast 390-1949

Send Maria a note when one is located and I will keep track of total.

Assignment Allocation Do Not Fill In – FQE Office Use Only

Assigned	FQE	Location	Assigned	FQE	Location
	Don Christoff	Florida		Tom Hecker	Minnesota
N/A	Tony Colarossi	Co. Garages		Brian Howe	Nevada
	Dave Cox	Texas		Gordie Kaltz	California
	Tony Dionisi	Colorado		Dan Myers	Iowa
	John Domin	Michigan		Tom Peeler	Georgia
	Dan Hamanack	Texas		Dave Pilgrim	Pennsylvania
	Mark Haydnk	Pennsylvania		Lynn Sorensen	Texas
	All	X		Ron Trower	Florida

ASSIGNMENT NO. 98

FCSD Field Quality Engineer (FQE) Request

Complete the FQE Support Request section of the form below (green headers).
If you have questions, contact Maria Lovelace (Mlovela1 323-6561)
After the form is completed, save it on your hard drive and send via E-mail to: Maria Lovelace

---

FCSD FQEs are trained engineers, familiar with all subsystems and vehicles. They visit dealership Service Departments and other Ford and Lincoln-Mercury service locations and fleets daily. FQEs can provide the following support services: Inspect vehicles for specific conditions; take photographs; recover and return failed components; locate vehicles for testing and/or inspection by other engineering personnel; perform test drives and record results.

Assignment Specifics	
Model Year(s) 1998/1999/2000	Requestor's Name N. Villarruel
Vehicle line(s) Windstar	Phone Number 313-322-7986
Mileage range All	Email Address NVILLARR
Part number(s)	Pictures/CQIS Reports? NR
Date Issued 16 May 2003	Due Date ASAP
What specific information and/or service are you requesting?	
Inspect vehicles and record information	
Geographic or Climatic Concern?	All geographic areas
What specific information do you want recorded (measurements, etc.)?	Record Mileage and VIN Use L04 to cover dealer cost of replacement.

Describe below the concern you are investigating – include information about the nature and severity of the concern.

NHTSA is conducting an investigation into Windstar wheel lug nut breakage. To assist in Ford Engineering investigation, please obtain the following components from the field.
Place priority on vehicles built in May/June of 1997

Obtain five (5) sets of the following parts from each of the model year (97-99) listed above:

1) Non- failed wheel assemblies' - 15 inch aluminum. Fronts only
   -1998 F78A-1007-BD (15x6.0 Aluminum wheel)
   -1999/2000 XF2a-1007-CC (15 x 6.5 Aluminum Wheel)
2) Front rotors – (base part 1125)
3) Front hub and bearing assy (1104)
4) Lug nuts

5 PER MY REQ

98	99	00
11	1111	11
111	11	1111 ???

Tag all parts with side removed (LH, RH) and with corresponding VIN.
Ship parts to attention:

Six Sigma Center
15080 Commerce Drive North
Dearborn, MI 48129
Attn: N. Villarruel 322-7986 or Syed Sarmast 390-1949

Send Maria a note when one is found.

Assignment Allocation Do Not Fill In – FQE Office Use Only					
Assigned	FQE	Location	Assigned	FQE	Location
x	Don Christoff	Florida	x	Tom Hacker	Minnesota
NA	Tony Colarossi	Co. Georges	x	Brian Howe	Nevada
x	Dave Cox	Texas	x	Gordie Kaltz	California
x	Tony Dicosisi	Colorado	x	Dan Myers	Iowa
x	John Dominy	Michigan	x	Tom Peeler	Georgia
x	Dan Hammock	Texas	x	Dave Pilgrim	Pennsylvania
x	Mark Hrycluk	Pennsylvania	x	Lyan Sorensen	Texas
				Ron Trower	Florida
ASSIGNMENT NO. 98					

WEBS HARDCOPY PARAMETER RECAP

BASIC PARAMETERS

REQUESTOR: NIEMAN KARL

REQUEST DATE/TIME: 96/06/11 12:48:09

REPORTS REQUESTED FOR: NIEMAN KARL

DESTINATION DEVICE: R3100805

PRINT DAT
E/TIME: 96/06/11 12:45:03

DATA EXTRACT DATE/TIME: 96/06/11 12:48:03

REPORT OPTIONS

HARD-COPY REQUEST-TYPE: ON-LINE REQUEST(LATEST DATA)

LANGUAGE: ENGLISH

PART DATA RESTRICTIONS:
NONE

SELECTION CRITERIA

NOTICE NUMBER:

PART NUMBER:

PART FUNCTION:

SECTION NUMBER: A10693103

REPORTS REQUESTED

RELEASE / CONCERN COVER DESIGN TERMINATION REPORT

0R RELEASE SUMMARY CONTENTS OF ASSEMBLY HAR ONLY:

0 RELEASE CHANGE SUMMARY CONCERN DETAIL

4B PART FUNCTION RELEASE X ALERT DETAIL

MULTI-FUNCTION RELEASE

ALERT DETAIL PRINT DATE/TIME: 96/06/11 12:45

PAGE: 1 ALERT NUMBER: A10633103

TYPE: (U) ONE PPM

ORIGIN ASSEMBLY: A NA20 ORAVILLE ASY DATE: 96/06/06

ORIGINATOR: MINEAR EARL PHONE: 89-33320 LOCATION: ORAVILLE ASSY. PLT

CESC: 040401 NOTICE NO: RESOLVING NOTICE:

ALERT DESC: SECURE TIRE AND WHEEL ASSY. TO VEHICLE (ALUMINUM WHEEL) ONLY
PROCESS # CL7900 EL 080

PRODUCTS AFFECTED: WINDSTAR

MODEL CODES: TVA3 MODEL YEAR: 96

PLANTS AFFECTED: NA20

ENG CONCERN CNTRL: ENG CONCERN CNTRL: INVALID:

PROGRAM: EFFECTIVE IN: OUT:

QTY: TIME: EMISSION CODE: 000 SLEP:

EST INCRM VAR COST: EST INCRM TOOL COST: EST INCRM LBR COST:

EST INCREMENTAL COST: PT EFFECT:

UNIT MEASURE: APPEARANCE:

SUPP DOCS: PROC. @CL7900 EL080 INST. MANUAL REV. CE-F66A-413-EA

---------- AFFECTED PARTS ----------

AFF PART NO: F2DC 1018 AA AFF PART DESC: NUT-WHEEL BOLT-1/2-20-UNF STD NSE IND: Y

CESC: / 040401 NOTICE:

ADJ: INTER: SUPPLY/LOCAL: AVAIL: FUNC REQD:

/ SUPPLIER:

---------- FURTHER DESCRIPTION/ALERT RESOLUTION/REASON FOR REJECTION ETC. ----------

---------- FURTHER DESCRIPTION/ALERT RESOLUTION/REASON FOR REJECTION ETC. ----------

USERID: ACTIVITY: MANAGEMENT DATE: 96/06/11

ALERT DESC:

A TORQUE PROCESS POTENTIAL STUDY WAS CONDUCTED ON THIS
OPERATION. IT INDICATES THAT THE PROCESS VARIATION IS WELL
WITHIN THE DYNAMIC TORQUE SPECIFICATION, BUT THE RESULTING
RESIDUAL TORQUE IS OUTSIDE THE SPECIFICATION.

ENGINEERING SPECIFICATION: 133.0 NM +/- 20.0 NM

DYNAMIC CAPABILITY: 1.42 PP, 1.39 PPK.

RESIDUAL INSPECTION LIMITS: 92.0 NM TO 153.6 NM

MINIMUM RESIDUAL TORQUE: 92.0 NM

THIS ALERT WAS BEEN ISSUED TO NOTIFY PRO OF THE MINIMUM
TORQUE VALUE THAT IS THE MEASURED OUTCOME OF THE PROCESS.
THIS STUDY DATA IS AVAILABLE UPON REQUEST.
THE STUDY FOR THE STEEL RIMS FELL WITHIN THE ENGINEERING
SPECIFICATION. NO RESIDUAL SPECS REQUIRED.

-MORE-

```
NSN-     ALERT DETAIL     PRINT DATE/TIME: 96/06/11 12:46 --------------------
         PAGE:  2         )        ALERT-NUMBER------:  Kmkq
         |      A10633103          |
         TYPE:  (U) DSN FSN        ------------------60m
ORIGIN ACTIVITY:        MA20 CARVILLE AFY        DATE:  96/06/06        STATUS: A
ORIGINATOR:33320    NIMMMMMMMM: CARVILLE ARMY. VAT PHONE:  Cg
SPEC:  060601  NOTICE NO:       RESOLVING NOTICE:

---------- APPROVALS ----------------------------------------------------------

ENTERED  DEPARTMENT      UNITID  ACTIVITY        APPROVER'S NAME DATE APPROVED   APPROVAL
                                                                  -CODE
@SMC     MA20MX  AA20F51 MA20    HIMMAM EARL     96/06/06
  M              55540           TMT1202          MA09              TRACEY, T.H.-SUBT RE        00/00/00
@SMC     Y702    TJH6977 MOAK    SCHRAMSKI, TOM J. -      00/00/00
  M      MA20MX  AA20F85 MA20    ADLD, D.         00/00/00
  M      AA20F51MMMMMM   MI@MMM EARL     96/06/11

-END-
```

CONAGRA # A10633103 Appendix B

Torque Process Potential Study Worksheet

Plant: O.A.P Cell no: WINDSTAR Date: MAY. 13. 96

PROCESS INFORMATION:

Process No: CL7900 Element No: 080 Data Mylar file name: Dyn: 22 Resid: 20

Study By: John E. Heck Control: (M) I S / W I N

Description: SECURE TRACK WHEEL ASSY TO CAR L/S STEEL

Torque Specifications (Nm):

Dynamic Mean: 133.0 Variance: ±20.0 Minimum (Static) _____ Nm

Tool Codes: Processed: CAN 16 Actual: CAN 16 Plant #: _____

Tool Manufacturer: C/P MULTI Model Number: _____

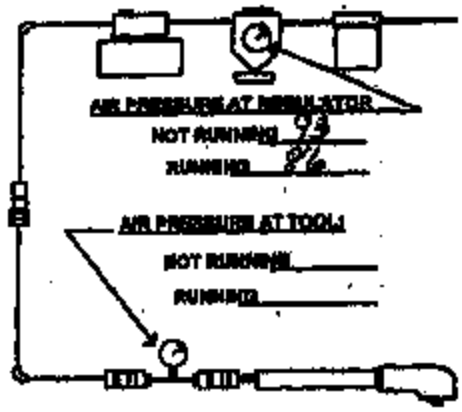
Type: (Air Shut-Off) Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: Good Length of Extension: 9" Driven: Bolt / (Nut)

Socket or Bit Size: 19 M.M. Transducer: 271.2 NM Bay Location: _____

Bolt #: _____ Nut #: CAC 10100 Part # _____

FULL STUDY STEEL



SKETCH OF OPERATION

Oil Test: None / (Trace) / Excessive Green Band: (Y) N

Torque Mean before adjustments: 135.6

Remarks: STEEL RIMS EAST SIDE L/S

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	66	66	135.2	134.7	− 0.5	146.0	156.7	124.4	112.8	21.6	43.9	1.85	1.65	116.9	157.1
2	66	66	133.9	131.8	− 2.6	146.9	147.4	121.0	113.2	26.0	36.2	1.54	1.47	118.0	145.1
3	66	66	134.5	137.5	+ 3.0	141.7	157.7	121.3	117.4	24.4	40.3	1.51	1.40	124.2	158.7
4	66	66	139.8	142.8	+ 10.0	147.1	167.0	132.5	132.7	26.6	46.3	1.54	1.47	129.1	167.5
5	66	66	133.1	134.4	+ 3	145.8	155.5	120.2	113.3	25.7	42.2	1.56	1.35	122.2	157.4
(12/94) RUN	330	330	134.1	139.9	+ 5.8	147.1	167.0	120.2	112.8	25.7	42.2	1.51	1.40	116.9	157.5

[redacted] Appendix B

Plant: O.A.P Cell/Line: WINDSTAR Date: 5-28-96

PROCESS INFORMATION: 081

Process No: CL 7900 Element No: [redacted] Data/Myte file root Dyn: 26 Rsdl: 29

Study By: Lowe & Mack Contact: M / I, S / W / N

Description: Assy Trk Cultivator Assy To Knuckle Steel Rims "R/S

Torque Specifications (Nm):

Dynamic Mean: 133.0 Variance: +/- 20.0 Minimum (Static) _____ Nm

Tool Codes: Processed: Cent 465 Actual: Cent 467 Plant #: _____

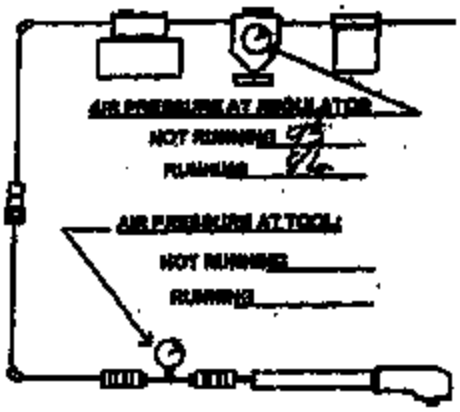
Tool Manufacturer: C/P Multy Model Number: _____

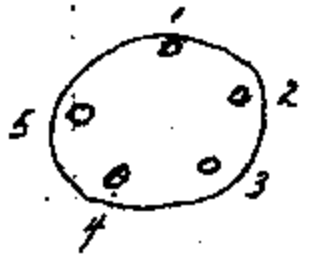
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: _____ Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Bit Size: 12 M.M. Transducer: 271-2U.N. Bay Location: _____

Bolt #: _____ Nut #: 23C10126E Part # _____





Mini Stroy STEEL

SKETCH OF OPERATION

Oil Test: None / Trace / Excessive Green Band: (Y) N

Torque Mean before adjustments: 134.8

Remarks: Mini Stroy "STEEL Rims" "WEST SIDE" R/S

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	133.1	148.6	15.5	146.1	168.1	120.0	129.1	26.2	39.0	1.53	1.53	132.8	170.0
2	22	22	135.8	132.1	3.8	147.6	132.8	124.1	116.4	23.5	41.4	1.70	1.46	128.3	153.6
3	22	22	132.6	134.4	2.8	142.4	156.6	121.2	112.2	21.7	44.1	1.85	1.81	126.9	152.6
4	22	22	133.5	139.8	6.3	145.9	164.9	121.1	114.7	24.8	44.2	1.61	1.57	129.6	166.0
5	22	22	133.3	140.3	7.0	148.5	167.0	121.0	113.6	24.5	53.4	1.63	1.61	127.2	155.7
(1/96) #	110	110	133.7	140.5	6.8	147.6	168.1	120.0	112.9	27.6	55.2	1.53	1.46	126.8	166.0

[redacted]

Appendix B

Torque Release Potential Study Worksheet

Plant: O.A.P Cell#: WINDSTAR Date: NOV 18: 98

PROCESS INFORMATION:

Process No: CL7800 Element No: 080 Date/Mfd file no#: Dyn: 21 Resid: 21

Study By: Jean C. Jack Control: (W) / S / I / W / I / N

Description: Secure Tool & Wheel Assy to Car L/F (ALUMINUM)

Torque Specifications (Nm):

Dynamic Mean: 133.0 Variance: +/- 20.0 Minimum (Static): _____ Nm

Tool Codes: Processed: CAV 167 Actual: CAV 167 Plant #: _____

Tool Manufacturer: C/C MULTI Model Number: _____

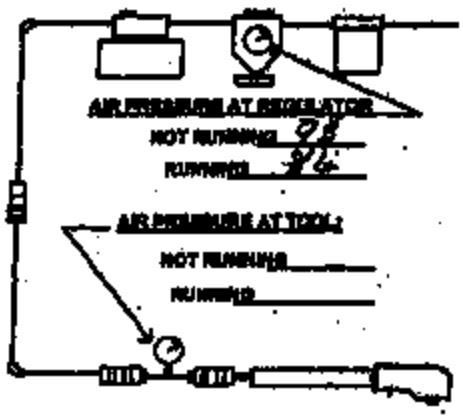
Type: (AF Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

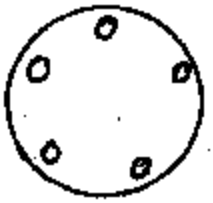
Socket Condition: CLEAN Length of Extension: 3" Driven: Bolt / (Nut)

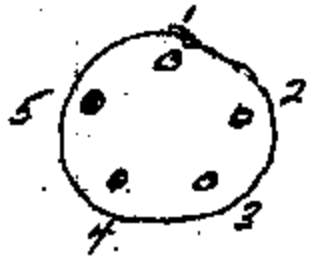
Socket or Bit Size: 12 M.M. Transducer: 271.2 N-M Bdy Location: _____

Bolt #: _____ Nut #: SPECIALTY Part #: _____

FULL STUDY ALL







SKETCH OF OPERATION

Off Test: None / (Trace) / Excessive Green Band: (Y) / N

Torque Mean before adjustments: 125.6

Remarks: ALUMINUM RIMS EAST SIDE L/S

Study Recap EXP LIMITS. 92.0 NM TO 159.0 NM.

OS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG DYN	RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	66	66	133.5	120.0	13.5	146.1	145.5	121.0	94.5	25.1	51.0	1.60	1.55	101.4	142.1
2	66	66	134.4	118.9	15.5	147.0	145.8	121.9	92.0	25.0	53.8	1.60	1.48	100.7	145.7
3	66	66	132.1	123.5	9.6	142.2	132.6	119.0	94.4	23.2	38.3	1.42	1.41	101.2	143.2
4	66	66	133.4	126.7	6.7	142.5	151.9	119.3	101.4	23.1	50.5	1.42	1.30	116.4	145.6
	66	66	132.8	123.5	9.3	145.0	143.7	120.6	103.2	24.4	40.4	1.64	1.63	106.6	140.5
1/94 TOTAL	330	330	133.4	122.3	11.1	147.5	152.6	119.0	92.0	24.4	60.5	1.42	1.39	101.2	145.6

LIMITS 159.6 NM — 92.0 NM

EDS-001 0498

[redacted]

Appendix B

Torque Process Control Study Worksheet

Plant: O.A.P Cell#: WINDSTAR Date: 5-29-96

PROCESS INFORMATION:

Process No: C4L7220 Element No: [redacted] 083 Data/Byte Removal Dyn: 2.5 Resid: 30

Study By: Jason Eshak Carried: M / S / W / N

Description: Assy Trace Wheel Assy F. Knuckle Aluminum Lugs" R/S

Torque Specifications (Nm):

Dynamic Mean: 138 Q Variance: ± 20 Q Minimum (Static) _____ Nm

Tool Codes: Processed: Cav 167 Actual: Cav 167 Plant #: _____

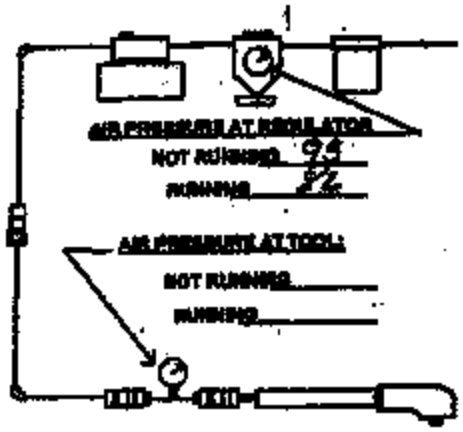
Tool Manufacturer: A/C Model Number: _____

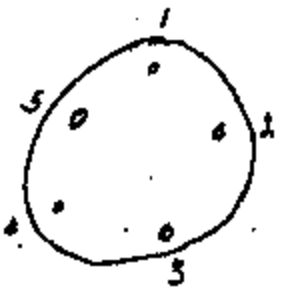
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: _____ Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Bit Size: 19 M.M. Transducer: 271-2 Bay Location: _____

Bolt #: _____ Nut #: 530C10126AE Part #: _____





SKETCH OF OPERATION

Oil Test: None / Trace / Excessive Green Band: (Y) / N

Torque Mean before adjustments: 138.8

Remarks: High Study "Aluminum" West Side R/S

Study Recap EXP LIMITS 92.0 NM TO 159.0 NM

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG DYN	RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	131.8	132.9	1.1	142.6	139.0	121.1	106.8	21.5	32.2	1.86	1.75	113.6	145.6
2	22	22	134.0	117.5	16.5	144.1	142.9	123.8	92.1	20.3	50.8	1.97	1.87	98.2	136.7
3	22	22	139.0	118.8	13.2	145.9	138.8	124.0	100.9	25.9	37.9	1.55	1.54	110.9	134.5
4	22	22	132.0	127.9	4.1	143.7	142.1	120.4	107.1	23.3	35.5	1.71	1.63	116.3	142.7
5	22	22	138.1	126.8	7.2	146.2	134.7	121.1	110.8	24.1	65.9	1.66	1.65	97.8	140.4
(12/94) ENG	110	110	132.8	125.6	7.2	146.9	139.0	120.0	92.1	25.9	66.9	1.66	1.54	98.2	145.6

E963-884 8/97

Appendix C

Torque Process Potential Study Worksheet

Plant: OAKVILLE Cutter: WINDSTAR Date: OCT-1-97

PROCESS INFORMATION

Process No: CL7900 Element No: 080 Datablyn Bit no: Dyn: M7 Rnd#: 99

Study By: Jamie Tack Control: M / S / W

Description: Assy Trans Wheel Assy To Car 4/5 Speed

Torque Specifications (Nm):

Dynamic Mean: 132.0 Variance: ±12.0 Residual Mean: _____ Variance: ±_____

Tool Codes: Processor: CAM 167 Actuator: _____ Plate #: _____

Tool Manufacturer: CP Model: _____ Model Number: _____

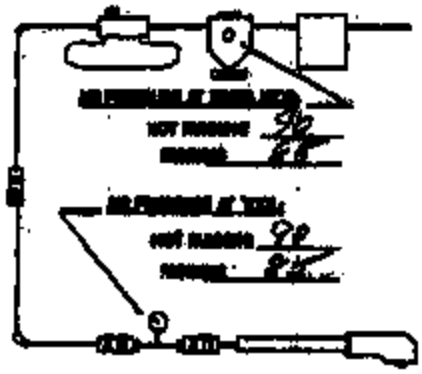
Type: Air Shut-Off / Clutch / Stall / Transducer Reaction Absorber: Y / N

Socket Condition: Good Length of Extension: 3" Driven Bolt / Nut

Socket or Bit Style: 12 M.M. Transducer: 221.2 M.M. Bay Location: _____

Bolt #: _____ Nut #: ES.DC.14.12 Part #: _____

5 NUTS



METHOD OF OPERATION

Oil Test: None / Thin / Extensive Green Book: Y/N

Torque Mean before adjustments: _____

Remarks: _____

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG DYN	6 SIG RESID	DYNAMIC Fp	DYNAMIC Fpk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	133.6	131.4	1.2	144.7	156.1	121.3	106.7	23.4	49.4	1.71	1.71	117.4	144.0
2	22	22	130.9	128.9	2.0	138.8	145.5	122.9	112.3	15.9	33.2	2.52	2.25	120.4	141.8
3	22	22	132.3	133.0	0.7	144.5	151.5	120.3	114.5	23.8	37.0	1.67	1.61	129.0	139.7
4	22	22	132.9	132.0	0.9	145.1	146.5	120.8	115.7	24.3	30.8	1.72	1.71	119.6	137.1
5	22	22	133.2	127.6	5.6	143.9	150.3	122.6	105.0	21.3	46.3	1.88	1.56	118.5	144.9
TOTAL	110	110	132.5	131.4	1.1	145.1	156.1	120.8	106.7	24.8	49.4	1.67	1.61	117.4	144.9

EXP LIMITS 166.7 - 156.1 NM

Appendix C

Torque Process Potential Study Worksheet

Plant: OAKVILLE Cell/Line: WINDSTAR Date: 2/97

PROCESS INFORMATION:

Process No: CL7720 Element No: 081 Datakyte file no: Dyn: 109 Resid: 101

Study By: JOHN C. TUCK Control: (M) S / W

Description: ASSY TUBE/SHEET ASSY TO CAP 3/8 STEEL

Torque Specifications (Nm):

Dynamic Mean: 138.0 Variance: +/- 20.0 Residual Mean: _____ Variance: +/- _____

Tool Cadet Transducer: CAM-167 Anvil: CAM 167 Plate #: _____

Tool Manufacturer: C.P. NUTT Model Number: _____

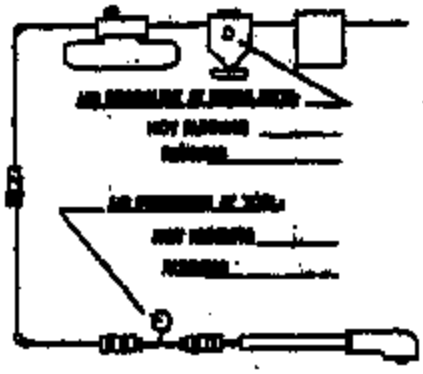
Type: (AF Rod-Off) / Clutch / Ball / Transducer Residue Absorbed: Y / N

Socket Condition: GOOD Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Bit Size: 12 MM Transducer: 871.2 MM Bay Location: _____

Bolt #: _____ Nut #: EX3C1012 Part #: _____

6 NUTS



METHOD OF OPERATION

Oil Test: None / (Tests) Remotes Grease Batch: Y / N

Torque Mean before adjustments: _____

Remarks: _____

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN DEPT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	130.4	130.2	1.8	143.6	153.6	121.3	114.8	22.3	38.8	1.79	1.74	111.25	145.4
2	22	22	133.7	132.0	2.3	144.3	153.6	123.1	119.4	21.3	33.2	1.88	1.81	121.3	142.1
3	22	22	133.1	129.9	6.8	143.4	161.6	122.8	118.1	20.6	43.5	1.96	1.94	118.3	145.6
4	22	22	133.6	131.9	7.1	142.4	168.3	125.8	118.0	17.6	45.3	2.04	1.98	122.4	146.9
5	22	22	133.2	133.5	0.3	144.8	155.2	121.7	111.8	23.1	43.4	1.93	1.71	119.8	143.2
TOT	110	110	132.2	131.4	4.4	144.8	168.3	121.3	111.8	23.5	51.5	1.79	1.71	118.5	145.9

[redacted]

Torque Process Capability Study Worksheet

Appendix C

Plant: OAKVILLE Carline: WINDSTAR Date: OCT 1-97

PROCESS DETERMINATION:

Process No: CL7920 Element No: OIL P. Double/Single Dye: 10X Ratio: 100

Study By: Lance A. Cook Country: (U) S / W

Description: Key Nose, Closest Key to Cap Fit Measurement

Torque Specification (Nm):

Dynamic Meter: 632.0 Variance: ±20.0 Rundown Meter: _____ Variance: ±_____

Tool Cubed: Pneumatic: Electric: Angle: 90N 167° Nose #: _____

Tool Manufacturer: AP Nutt Model Number: _____

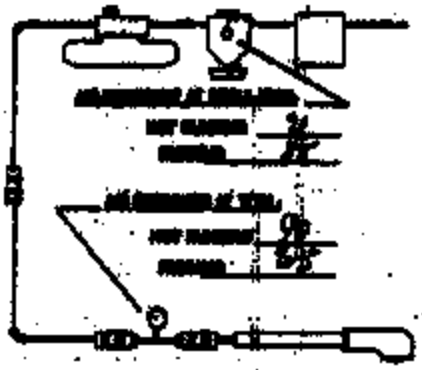
Type: Air Run-Off / Clutch / Ball / (Impact) Rundown Adjustment: (Y) / N

Socket Condition: Good Length of Extension: 3" Drive: Bolt / Nut

Socket or Bit Size: 12 Mult. Transducer: 27-2 Mult. Key Location: _____

Bolt #: _____ Nut #: E8AZ 7A12 Part #: _____

5 NOTS OK



MODE OF OPERATION

Oil Test: None / Tight / Rundown Green Band: Y / N

Torque Mode before adjustment: _____

Remarks: _____

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RNDN	MEAN DYN	MEAN RNDN	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RNDN	-3 SIGMA DYN	-3 SIGMA RNDN	6 STD RANGE DYN	6 STD RANGE RNDN	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	[illegible]	112.8	31.6	146.5	137.2	120.2	78.4	24.3	48.8	1.65	1.54	100.1	138.0
2	22	22	131.6	112.3	19.3	139.7	129.0	123.6	95.2	16.1	33.8	2.48	2.32	100.4	130.1
3	22	22	124.6	102.8	21.8	143.8	133.8	124.4	104.7	20.4	33.1	1.79	1.66	100.0	138.9
4	22	22	128.9	101.5	25.4	142.8	119.6	125.1	95.4	17.7	52.1	2.25	2.15	101.7	132.7
5	22	22	134.2	115.1	19.1	146.4	138.0	121.8	91.3	24.6	47.7	1.61	1.51	100.4	131.6
TOT R	594	110	133.1	118.0	16.1	146.6	147.6	120.4	89.4	26.2	59.2	1.66	1.51	100.1	139.7

[redacted]

Appendix C

Torque Process Potential Study Worksheet

Plant: OAKVILLE Customer: WINDSTAR Date: OCT-8-91

PROCESS INFORMATION

Process No: CL7800 Element No: 083 Desirable Min Drift DPM: 110 Points: 102

Study By: TOM & MARK Control: (W) E / W

Description: Assy. Final Cultural Assy to Case Bk Aluminum

Torque Specification (Nm):

Dynamic Mean: 188.0 Variation: ±6.0 Residual Mean: _____ Variation: ±_____

Tool Cluster Presently: CHAN-LIT Assign: CHAN 16T Data #: _____

Tool Manufacturer: C/P MAKER Model Number: _____

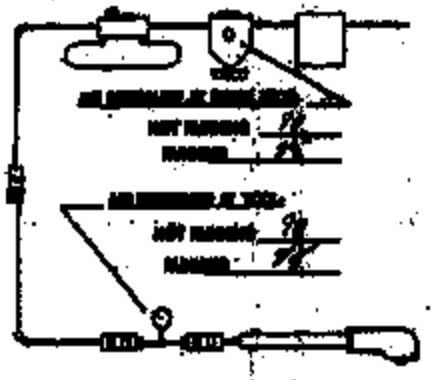
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: (Y) / N

Socket Condition: GOOD Length of Extension: 3" Driven Bolt / Nut

Socket or Bit Size: 12 M.M. Transducer: 27N-2 M.M. Key Location: _____

Bolt #: _____ Nut #: E3DC 10 12 M Part #: _____

5 NUTS



SEQUENCE OF OPERATION

Oil Tool: None / (Used) / Removed Green Bank: Y / N

Torque Mean before adjustment: _____

Remarks: _____

Study Ramp

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN DEPT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	184.1	180.8	4.1	145.5	144.1	122.7	95.0	22.8	49.2	1.75	1.66	161.4	189.9
2	22	22	185.1	132.0	14.0	146.8	164.1	123.5	90.1	23.3	44.0	1.72	1.53	101.3	146.5
3	22	22	136.0	133.3	1.2	145.8	164.5	126.2	146.+	21.7	55.4	1.85	1.66	111.6	140.8
4	22	22	136.0	131.5	5.5	145.1	178.9	126.0	98.2	24.8	32.6	1.98	1.78	118.2	144.8
5	22	22	141.7	145.0	7.4	148.9	164.6	123.7	96.8	25.2	67.6	1.98	1.90	101.7	141.2
AVG R	110	110	134.6	134.8	5.2	146.8	171.9	125.7	96.1	15.8	52.8	1.72	1.55	101.8	144.8

Plant: OAKVILLE Cartine: MUSTANG Date: APRIL 19/2000

PROCESS INFORMATION:
Process No: 4.7900 Element No: 080 Datakyte file was: Dyn: _____ Read: _____
Study By: KMN & GARY Control: (M) S / W / N
Description: TIRE AND WHEEL ASS TO VEHICLE

Torque Specifications (Nm):
Dynamic Mean: 133.0 Variance +/- 20.0 Minimum (Static) _____
Tool Codes: Processed: ATLAS IMPACT Actual: _____ Plant #: _____
Tool Manufacturer: ATLAS COPCO Model Number: _____
Type: Air Shut-Off / Clutch / Stall / Transducer Rejection Observed: Y / N
Socket Condition: GOOD Length of Extension: SIX IN. Driven: Bolt (Nut)
Socket or Bit Size: 19 MM Transducer: 291.2 MM Bay Location: _____
Bolt #: _____ (Nut) FBMC1012-AA Part #: _____
E8DC1012-AA

Sketch of Operation

5 FAST

LSS

Oil Test: None / Trace / Excessive Green Band: Y / N
Torque Mean Prior To Adjustments was: _____ Nm
Remarks: _____

Study Runs

Cycle	Sample Size DYN	Sample Size RESID	Mean DYN	Mean RESID	Mean SHIFT	Std Dev DYN	Std Dev RESID	Range DYN	Range RESID	Skewness DYN	Skewness RESID	Dynamic Pp	Dynamic Ppk	Residual LOW	Residual HIGH
1	176	66	134.0	135.3	9.3	13.6	11.5	62.8	42.5	3.57	39.7	1.55	1.47	121.0	149.7
2	176	66	134.3	136.1	6.3	13.0	11.2	62.8	41.7	3.44	41.5	1.61	1.53	121.5	150.1
3	176	66	134.8	136.8	6.8	13.0	10.8	62.8	41.8	3.44	38.2	1.61	1.65	119.3	152.5
4	176	66	134.1	136.7	7.1	12.8	11.1	62.8	41.8	3.43	40.3	1.61	1.50	121.2	150.3
5	176	66	134.4	136.9	6.9	12.9	10.9	62.8	42.1	3.41	41.1	1.61	1.53	120.7	152.3
Avrgs	880	330	134.0	135.8	7.3	13.0	11.1	62.8	42.0	3.46	40.2	1.55	1.54	120.7	150.8

EVP Limits 118.8 – 171.9

Torque Process Potential Study Worksheet

Plant: OAKVILLE Cell/no: MUNDSTOCK Date: APRIL 19th 00

PROCESS INFORMATION:
Process No: CL7900 Element No: 081 Data/Byte file nos: Dyn: _____ Pass/d: _____
Study By: DAN + GARY Control: (M) S / W / N
Description: TIRE AND WHEEL ASS TO HUB LR

Torque Specifications (Nm):
Dynamic Mean: 133.0 Variance ± 20.0 Minimum (Static) _____
Tool Codes: Processed: GUN RUNNER Actual: _____ Plant #: _____
Tool Manufacturer: ATLAS COPCO Model Number: _____
Type: Air Shut-Off / Clutch / Stall / Transducer Reaction Absorbed: Y / N
Socket Condition: GOOD Length of Extension: 8.5" IN Driven: Bolt (Nut)
Socket or Bit Size: 19 MM Transducer: 22112 Bay Location: _____
Bolt #: _____ Nut #: ERNC1012-AA Part #: _____
ES DC1012-AA

Sketch of Operation

5 FAST

RS S

Oil Test: None / Trace / Excessive Green Band: Y / N
Torque Mean Prior To Adjustments was: _____ Nm
Remarks: _____

Study Recap

Op	Samples Size DYN	Samples Size PASSD	Mean DYN	Mean PASSD	Mean Shift	3 Sigma DYN	3 Sigma PASSD	6 Sigma DYN	6 Sigma PASSD	Cpk DYN	Cpk PASSD	DYN/PASS Pp	DYN/PASS Ppk	Residual Low	Residual High
1	66	66	131.0	134.4	12.0	13.5	17.5	13.2	11.7	5.12	5.54	11.09	11.98	123.1	146.4
2	66	66	133.0	149.0	26.0	13.5	17.9	13.2	11.8	5.3	6.3	11.4	11.8	123.8	142.4
3	66	66	130.0	150.1	26.1	13.5	17.6	13.2	11.7	5.2	6.5	11.4	11.9	124.2	141.3
4	66	66	133.0	133.2	26.4	13.5	17.6	13.2	11.5	5.0	5.7	10.8	9.1	123.1	146.8
5	66	66	134.0	135.4	26.3	13.5	16.4	13.2	12.9	5.3	5.2	11.4	11.0	132.5	135.6
Range	330	330	134.0	150.1	26.1	13.6	17.5	13.2	11.5	5.3	6.5	11.4	9.1	123.1	171.3

EXP LIMITS 117.5 — 182.6

CHANGE OR REVIEW DATA

Command ===> * FOrward

PROC. NUMBER	10 CM T L	(6) INST TORQ MEAN	(7) INST TORQ VAR +/-	(8) MIN TORQ	(22) RNGID MEAN SHIFT +/-	(27) RNGID * $ * Sigma RANGE	(29) DEN SPEC RANGE	(28) RNGID LIMIT REQD	(30) CR/CR OR ALERT REQD	(17) NEW ALERT HIGH	(18) NEW ALERT LOW
CL7900	M	133.0	20.0	.0	5.8	62.2	60.0	YES	NO	167.0	112.8
CL7900	M	133.0	20.0	.0	6.8	55.2	60.0	YES	NO	168.1	113.9
CL7900	M	133.0	20.0	.0	11.1	60.5	60.0	YES	ALERT	152.6	92.0
CL7900	M	133.0	20.0	.0	- 7.2	66.9	60.0	YES	ALERT	159.0	92.1
CM1000	M	40.0	6.0	.0	2.3	15.1	12.0	YES	NO	49.8	34.7
CM2000	M	40.0	6.0	.0	2.7	18.3	12.0	YES	NO	50.6	34.3
CM2100	M	40.0	6.0	.0	1.4	20.0	12.0	YES	NO	51.4	31.4
CM3000	M	40.0	6.0	.0	0.5	3.7	12.0	NO	NO	.0	.0
CM9000	M	47.2	7.2	.0	-4.3	13.1	14.4	YES	ALERT	50.3	39.9
CV0500	S	30.0	4.5	.0	1.3	6.1	9.0	NO	NO	.0	.0
CV0560	S	62.5	9.4	.0	1.2	13.0	18.8	NO	NO	.0	.0
CV5000	S	12.0	1.8	.0	0.8	1.7	3.6	NO	NO	.0	.0

PF 1=Help 2=Top 3=End 4=Upd 5=Del 6=Copy 7=Back 8=Fwd 9=Ins 10=L 11=R 12=Bot

****
* Note printed by GCARLOZZ on 4 Mar 1997 at 06:56:29 *
****

From: RWOODY1 --DRBN004 Date and time 03/04/97 06:45:48
To: GCARLOZZ--DRBN004

FROM: Ronald Woody CANET(UTC -05:00)
Subject: Urgent!! -- Wheel Lugnut Torque
GET DAN TO ANS. THIS. I WOULD LIKE TO SEE THE ANSWER BEFORE IT LEAVES THE PLANT
.

Regards,
Ronald Woody
*** Forwarding note from JBIENIEK--DRBN004 03/03/97 12:41 ***

To:	JFRYDE --DRBN004	PKOVACEV--DRBN004
	SHENDER2--DRBN004	AWELLS2 --DRBN004
	JRODRI25--DRBN007	JFOWLER1--DRBN004
	MMARTIN8--DRBN004	GBAKER2 --DRBN004
	PVANDERG--DRBN005	MWASCHAK--DRBN004
	SHOLLOW1--DRBN004	AJEMISON--DRBN004
	DAULD1 --DRBN004	DMILASKY--DRBN004
	ESCHACK1--DRBN004	CMCKEACH--DRBN004
	TLEE2 --DRBN004	TJOYCE --DRBN004
	DLAMERAT--DRBN004	PLEE2 --DRBN004
	RMORGAN --DRBN005	SZONCA --DRBN004
	GWILLI28--DRBN004	CDOWD --DRBN004
	MGONZA10--DRBN004	
cc:	EVANBERG--DRBN004	RVARTO --DRBN004
	HJACKSON--DRBN004	KWARD2 --DRBN004
	RMONGEON--DRBN005	SRYAN --DRBN004
	SABBOTT1--DRBN004	DMILLMAN--DRBN004
	JVANNOOR--DRBN004	JGROW --DRBN004
	RELLIS3 --DRBN004	GSTEWAR4--DRBN004
	RMONTANO--DRBN004	CMOYNIHA--DRBN004
	GCANO --DRBN004	JWOOD4 --DRBN005
	RSEWELL --DRBN005	RWOODY1 --DRBN004
	PSPANN --DRBN004	RPAULSON--DRBN004
	JSCHNIE4--DRBN004	SBASKA1 --DRBN004
	GBROCKWA--DRBN004	

FROM: Joe Bieniek USAET(UTC -05:00)
Subject: Urgent!! -- Wheel Lugnut Torque

There has been some concerns raised by the Dealer Counsel in regards to the correct torque being applied to lugnuts by wheel multiples. In efforts to prove our capability, the Fastening Systems section is requesting the following from each plant.

1) One year of inspection data (TISS). We feel a good summary of this is the Process Ranking Summary Report. Please send the pages of this report that contain lugnut data for each month starting January 1996.
12 pages
2) A copy of the latest TPPS study done on the wheel multiples.
4 pages
3) Provide the current dynamic specifications set in the multiples. And provide the current specification (range) that the inspectors are using for residual readings.

4) Provide the lowest residual reading the inspectors are encountering.

MARCH 5, 1997

TO: JOE BIENIEK

FROM: DAN AULD (DAULD1)

CC: RON WOODY (RWOODY1)
DAVID LEECH (DLEECH)

I am faxing you the information you requested on the Wheel Nut Torques. You will notice that the first four sheets are the Torque Process Potential Studies (TPPS) for steel (LS & RS) and for aluminum (LS & RS). The next 12 sheets are the Process Ranking Summary Sheets (PRSS) by month for a year with July's data combined with June's data due to the 3 week layoff. The data for the Wheel Nut Torques are highlighted as well as the lowest residual readings for the month in the 10th column. The dynamic specification of 113.0 Nm to 153.0 Nm is located on the 4 TPPS sheets as well as the 11th and 12th column on the PRSS sheets.

Could you send me a profs acknowledging that you have received this information and that the data satisfies your request.

Regards,

Dan Auld
Fastening Systems Co-ordinator
Oakville Assembly Plant

[redacted]

Appendix B

Torque Process Potential Study Worksheet

Plant: O.A.P Cell/ine: WINDSTAR Date: 5-29-96

PROCESS INFORMATION:

Process No: CL T800 Element No: 083 Data/Myte file nos: Dyn: 25 Resid: 30

Study By: John E Mak Control: (M) / S / W / N

Description: Assy Tire & Wheel Rear Vehicle Aluminum 1.05" R/S

Torque Specifications (Nm):

Dynamic Mean: 133.0 Variance: +/- 20.0 Minimum (Static) _____ Nm

Tool Codes: Processed: Cen 167 Actual: Cen 167 Plant #: _____

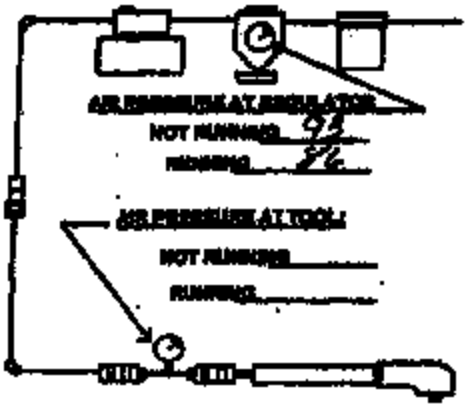
Tool Manufacturer: A/P Model Number: _____

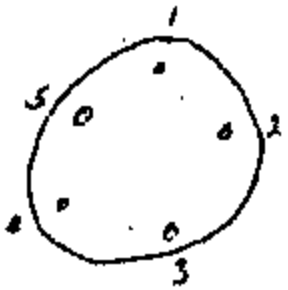
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: _____ Length of Extension: 2" Driven: Bolt / (Nut)

Socket or Bit Size: 19 M.M Transducer: 771-2 Bay Location _____

Bolt #: _____ Nut #: F3DC1012.BB Part # _____





SKETCH OF OPERATION

Oil Test: None / Trace / Excessive Green Band: (Y) / N

Torque Mean before adjustments: 138.8

Remarks: Hill Stroy "Aluminum" West Side R/S

Study Recap EXP LIMITS 92.0NM To 159.0NM

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	22	22	131.8	132.9	1.1	142.6	152.0	121.1	106.8	21.5	42.2	1.86	1.75	113.4	146.6
2	22	22	134.0	117.5	16.5	144.1	142.9	123.8	92.1	20.3	50.8	1.97	1.87	98.2	136.7
3	22	22	133.0	119.8	13.2	145.9	138.8	120.0	100.9	25.9	37.9	1.55	1.54	110.9	134.6
4	22	22	132.0	127.2	4.1	143.7	148.1	120.4	107.7	23.3	40.5	1.71	1.63	116.3	142.7
5	22	22	133.1	128.8	4.3	145.2	154.7	121.1	103.8	24.1	50.9	1.66	1.65	99.8	142.4
2/94) 6	110	110	132.8	125.6	7.2	145.9	152.0	120.0	92.1	25.9	66.9	1.66	1.54	98.2	145.6

EXP-694 0297

[redacted] Appendix B

Plant: O.A.P Cartline: WINDSTAR Date: MAY 18. 96

PROCESS INFORMATION:

Process No: CL1200 Element No: 087 DataMyte file nos: Dyn: 21 Resid: 21

Study By: Jose C. Mat Control: (Y) / S / W / N

Description: Secure Trac wheel hose to Case (L) (ALUMINUM)

Torque Specifications (Nm):

Dynamic Mean: 133.0 Variance: 4.20 Minimum (Static) _____ Nm

Tool Codes: Processed: CAV 167 Actual: CAV 167 Plant #: _____

Tool Manufacturer: C/P MULTI Model Number: _____

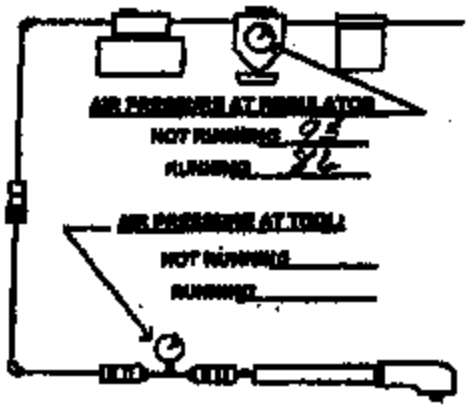
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

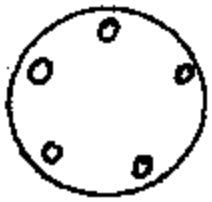
Socket Condition: Good Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Bit Size: 19 M.M. Transducer: 271.2 N.M Bay Location: _____

Bolt #: _____ Nut #: Specialty Part # _____

FULL STROY ALUM





SKETCH OF OPERATION

Oil Test: None / (Trace) / Excessive Green Band: (Y) / N

Torque Mean before adjustments: 135.6

Remarks: ALUMINUM KMS EAST SIDE 2/5

Study Recap EXP LIMITS. 92.0 NM To 159.0 NM.

SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
66	66	133.5	120.0	13.5	146.1	145.6	121.0	94.5	25.1	51.0	1.60	1.45	101.4	145.7
66	66	134.4	118.9	15.5	147.0	145.8	121.9	92.0	25.0	53.9	1.60	1.48	101.7	145.7
66	66	132.1	123.5	7.6	147.2	132.6	119.0	94.4	28.2	38.3	1.42	1.41	101.3	143.7
66	66	133.4	126.7	6.7	147.5	137.9	119.3	101.4	28.1	36.5	1.42	1.39	110.4	145.6
66	66	132.5	123.5	9.3	145.0	142.7	120.0	103.2	24.4	44.4	1.64	1.63	96.6	140.5
330	330	133.4	122.3	11.1	147.5	132.6	113.5	92.0	24.4	40.5	1.42	1.39	101.2	145.6

EWS-001 0000

[redacted]

Appendix B

Torque Process Capability Study Worksheet

Plant: D.A.P. Customer: WINDSTAR Date: 5-28-96

PROCESS INFORMATION: 081

Process No: CL7900 Element No: [redacted] Datalyte file nos: Dyn: 26 Resid: 29

Study By: John & Mark Contact: M / B / W / N

Description: Rear Trac Cylinder Rod To Manifold "Stack Rods" R/S

Torque Specifications (Nm):

Dynamic Mean: 132.0 Variance: ±20.0 Minimum (Static): _____ Nm

Tool Codes: Processed: Can 167 Actual: Can 167 Plant #: _____

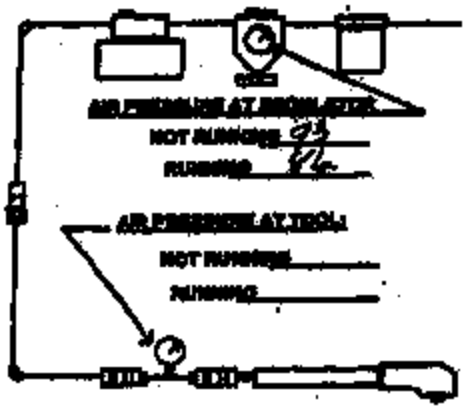
Tool Manufacturer: C/P Hytn Model Number: _____

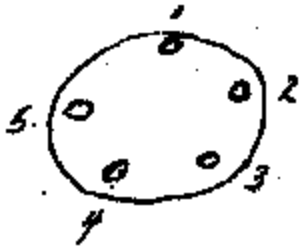
Type: (Air Shut-Off) / Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: _____ Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Bit Size: 18 M.M. Transducer: 271-2WL Bay Location: _____

Bolt #: _____ Nut #: 83C.101228 Part #: _____





Mini Study Steel

SKETCH OF OPERATION

Oil Test: None / Trace / Excessive Green Bands (Y) N

Torque Mean before adjustments: 138.8

Remarks: Mini Study "Stack Rods" West Side R/S

Study Recap

SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG DYN RANGE	6 SIG RESID RANGE	DYNAMIC Rp	DYNAMIC Rpk	RESIDUAL LOW	RESIDUAL HIGH
22	22	139.1	148.6	± 15.5	146.1	168.1	124.0	128.1	26.2	32.0	1.53	1.53	132.5	157.0
22	22	138.8	139.1	± 3.3	147.6	152.8	124.1	118.4	28.5	41.4	1.70	1.46	122.9	153.0
22	22	132.6	135.4	± 2.8	148.4	156.8	121.7	118.2	31.7	46.1	1.85	1.81	124.8	156.6
22	22	133.5	138.8	± 6.3	145.9	160.2	121.1	117.7	24.8	44.2	1.61	1.57	128.6	160.0
22	22	133.3	140.3	± 7.0	146.5	167.0	121.0	113.6	24.5	53.4	1.63	1.61	127.2	165.7
110	110	133.7	140.5	± 6.8	147.6	168.1	120.0	112.9	27.6	55.2	1.53	1.46	126.8	166.0

[redacted]

Appendix B

Torque Dynamic Rotational Study Worksheet

Plant: O.A.P Cell/Line: WINDSTAR Date: MAY. 13. 96

PROCESS INFORMATION:

Process No: CL7800 Element No: 0820 Datakit file nos: Dyn: 20 Resid: 20

Study By: Louis E Sack Control: (M) / S / W / N

Description: Secure Tube Wheel Assy To Axle L/S

Torque Specifications (ft-lb)

Dynamic Mean: 133.0 Variance: ±20.0 Minimum (Static): _____ ft-lbs

Tool Codes: Processed: CAN 16 Actual: CAN 16 Plant #: _____

Tool Manufacturer: C/P MULTI Model Number: _____

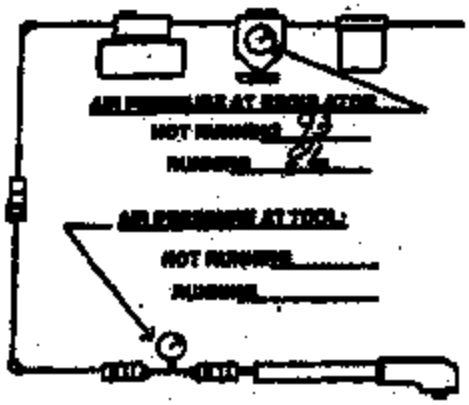
Type: (Air Shut-Off) Clutch / Stall / Transducer Reaction Absorbed: Y / N

Socket Condition: Good Length of Extension: 3" Driven: Bolt / (Nut)

Socket or Slit Size: 19 M.M. Transducer: 271-2MM Bay Location: _____

Bolt #: _____ Nut #: CBC 10280 Part #: _____

FULL STUDY SHEET



SKETCH OF OPERATION

Oil Test: None / (Trace) / Excessive Green Bands (Y)/N

Torque Mean before adjustments: 135.6

Remarks: STEEL RIMS EAST SIDE L/S

Study Recap

OS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	+3 SIGMA DYN	+3 SIGMA RESID	-3 SIGMA DYN	-3 SIGMA RESID	6 SIG RANGE DYN	6 SIG RANGE RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
1	66	66	135.2	134.7	-0.5	146.0	146.7	124.4	122.8	21.6	23.9	1.85	1.68	116.9	121.4
2	66	66	133.9	134.8	-2.6	146.9	147.4	121.0	122.2	25.9	25.2	1.54	1.47	118.0	146.1
3	66	66	134.5	137.5	+3.0	147.7	157.7	121.3	117.4	24.4	40.3	1.51	1.20	124.2	157.7
4	66	66	138.8	143.8	+6.0	147.1	167.0	130.5	120.7	26.6	46.3	1.34	1.17	128.1	139.5
5	66	66	133.1	134.4	-1.3	145.9	159.5	120.2	112.8	25.7	46.2	1.56	1.33	116.2	159.4
1/2/3/4/5	330	330	134.1	139.9	+5.8	147.7	167.0	120.2	112.8	25.7	42.2	1.51	1.40	116.9	159.5

ESG-464 0518

[redacted]

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 01/01/97 - 01/31/97 Dept: All
Shift: All Shifts Class: All
Type: All
Zone: All
Oper: All
Carr: All
Joker: All
Line: All
Printed on 02/03/97, 1:13 PM
TIRS v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rotation	%Reclaim	Worst	High Limit	Low Limit
59	CJ4601021	REC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		80.5	59.5
60	CJ4623094	ASS. REAR JOUNCE BOBE BRK. TO BACKING PL	440	0	0	0.00%	91.14%	0	7.6	10.4	7.6
61	CJ4623091	ASS. REAR JOUNCE BOBE BRK. TO BACKING PL	440	0	0	0.00%	53.41%	0	7.6	10.4	7.6
62	CJ4623100	REAR BRAKE TUBE TO BACKING PLATE L/S	440	0	0	0.00%	32.95%	0	14.8	20.2	14.8
63	CJ4623101	REAR BRAKE TUBE TO BACKING PLATE R/S SAHYO	440	0	0	0.00%	28.41%	0	14.8	20.2	14.8
64	CJ4650030	ASSMB & REC REAR BRAKE TUBES TO HOSES -	440	0	0	0.00%	13.64%	0	13.3	17.7	12.3
65	CJ4650031	ASSMB & REC REAR BRAKE TUBES TO HOSES -	440	0	0	0.00%	28.41%	0	13.4	17.7	12.3
66	CJ2300079	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	440	0	0	0.00%	5.68%	0	11.4	20.9	11.3
67	CJ2319180	SECURE ABS MTD VALVE TO SIDERAIL	440	0	0	0.00%	12.50%	0	23.7	34.5	25.5
68	CJ2330140	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2430140	0	0	0	0.00%	0.00%	0		18.6	11.6
69	CJ2330180	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE	440	0	0	0.00%	25.00%	0	14.8	20.2	14.8
70	CJ2430090	REC FRONT BRAKE TUBES TO MASTER CYLINDER	440	0	0	0.00%	23.86%	0	9.2	15.9	8.9
71	CJ2430070	REC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
72	CJ2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	440	0	0	0.00%	3.41%	0	98.5	168.2	94.1
73	CJ2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	440	0	0	0.00%	4.55%	0	94.2	168.2	94.1
74	CJ2521100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.3	97.7
75	CJ2640090	REC FRONT BRAKE HOSE TO CALIPER - L/S	440	0	0	0.00%	9.09%	0	44.8	63.3	46.7
76	CJ2640091	REC FRONT BRAKE HOSE TO CALIPER - R/S	440	0	0	0.00%	10.23%	0	44.7	63.3	46.7
77	CJ2640100	REC FRONT BRAKE HOSE TO BRAKE TUBE - L/S	440	0	0	0.00%	19.32%	0	9.9	16.5	9.5
78	CJ2640101	REC FRONT BRAKE HOSE TO BRAKE TUBE - R/S MULTI-SPINDLE	440	0	0	0.00%	43.18%	0	10.3	16.6	9.5
79	CK0100060	SECURE FUEL FILLER PIPE TO BODY	440	0	0	0.00%	25.00%	0	3.6	5.1	3.0
80	CK0200250	ASSM FUEL TANK TO UNDERBODY (20 GALLON)	440	0	0	0.00%	14.77%	0	40.6	54.7	46.3
81	CK0225260	ASSM FUEL TANK TO UNDERBODY (25 GALLON)	440	0	0	0.00%	25.00%	0	40.3	54.7	46.3
82	CK0500070	INSTALL RETURN HOSE CLAMP	440	0	0	0.00%	6.82%	0	2.0	3.2	2.0
83	CK0500220	INSTALL FUEL FILLER CLAMP	440	0	0	0.00%	12.50%	0	1.1	4.5	1.1
84	CK1400060	ACCEL ASKT & RET SPRING TO ENG. 3.0L	440	0	0	0.00%	25.68%	0	12.7	17.3	12.7
85	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	440	0	0	0.00%	9.09%	0	113.4	153.0	113.0
86	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/S MULTI-SPINDLE	440	0	0	0.00%	21.59%	0	113.4	153.0	113.0
87	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/S (ALUM.) MULTI-SPINDLE	440	0	0	0.00%	0.00%	0	108.7	159.0	98.0
88	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/S (ALUM.) MULTI-SPINDLE	440	0	0	0.00%	1.14%	0	102.8	159.0	98.0

[redacted]

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 02/01/97 - 02/28/97 Dept: All Car: All Printed on
Shift: All Shifts Cleanr: All Zone: All Xder: All 03/05/97, 1:36 PM
Type: All Super: All List: All TISR v 6.71

MANDATORY Processes

Rnk	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rejects	Checksum	Worst	High Limit	Low Limit
59	CJ0601021	SEC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		80.5	59.5
60	CJ0623090	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	395	0	0	0.00%	54.43%	0	7.6	10.4	7.6
61	CJ0623091	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	395	0	0	0.00%	63.29%	0	7.6	10.4	7.6
62	CJ0623100	REAR BRAKE TUBE TO BACKING PLATE L/S	395	0	0	0.00%	84.05%	0	14.8	20.2	14.8
63	CJ0623101	REAR BRAKE TUBE TO BACKING PLATE R/S SANTO	395	0	0	0.00%	27.85%	0	14.8	20.2	14.8
64	CJ0650086	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	395	0	0	0.00%	32.91%	0	12.5	17.7	12.3
65	CJ0650031	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	395	0	0	0.00%	25.32%	0	12.3	17.7	12.3
66	CJ2304070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	390	0	0	0.00%	3.85%	0	11.3	29.9	11.3
67	CJ2319180	SECURE ABS HYD VALVE TO SIDERAIL	390	0	0	0.00%	8.97%	0	26.5	34.5	25.5
68	CJ2330140	ASS. RR FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2450140	0	0	0	0.00%	0.00%	0		18.6	11.6
69	CJ2330180	ASS. RR FRT BRAKE TUBE TO TUBE BUNDLE	390	0	0	0.00%	32.05%	0	16.9	20.2	14.8
70	CJ2430090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	390	0	0	0.00%	30.77%	0	9.3	15.9	8.9
71	CJ2450070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
72	CJ2520180	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	395	0	0	0.00%	2.53%	0	94.4	168.2	94.1
73	CJ2520181	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	395	0	0	0.00%	6.33%	0	95.7	168.2	94.1
74	CJ2521180	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.3	97.7
75	CJ2540090	SEC FRONT BRAKE HOSE TO CALIPER - L/S	395	0	0	0.00%	12.66%	0	46.8	63.3	46.7
76	CJ2540091	SEC FRONT BRAKE HOSE TO CALIPER - R/S	395	0	0	0.00%	7.59%	0	46.7	63.3	46.7
77	CJ2540100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/S	390	0	0	0.00%	29.49%	0	9.6	16.5	9.5
78	CJ2540101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/S MULTI-SPINDLE	390	0	0	0.00%	33.90%	0	9.7	16.6	9.5
79	CK0100040	SECURE FUEL FILLER PIPE TO BODY	385	0	0	0.00%	10.39%	0	3.3	5.1	3.0
80	CK0200050	ASSM FUEL TANK TO UNDERBODY (20 GALLON)	395	0	0	0.00%	29.11%	0	48.3	54.7	40.3
81	CK0220060	ASSM FUEL TANK TO UNDERBODY (25 GALLON)	395	0	0	0.00%	29.32%	0	48.3	54.7	40.3
82	CK0500070	INSTALL RETURN HOSE CLAMP	395	0	0	0.00%	12.66%	0	2.6	5.2	2.0
83	CK0500280	INSTALL FUEL FILLER CLAMP	395	0	0	0.00%	13.92%	0	1.2	4.5	1.1
84	CK1400060	ACCEL BRKT & RET SPRING TO ENG. 3.0L	395	0	0	0.00%	41.77%	0	12.7	17.3	12.7
85	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	385	0	0	0.00%	19.48%	0	113.0	159.0	113.0
86	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/S MULTI-SPINDLE	385	0	0	0.00%	15.58%	0	113.0	159.0	113.0
87	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/S (ALUM.) MULTI-SPINDLE	385	0	0	0.00%	1.30%	0	97.7	159.0	92.0
88	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/S (ALUM.) MULTI-SPINDLE	385	0	0	0.00%	0.00%	0	99.8	159.0	92.0

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OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Dates: 12/01/96 - 12/31/96 Dept: All Cars: All Printed on
Shifts: All Shifts Class: All Zone: All Mdrs: All 01/15/97, 11:21 AM
Type: All Super: All Lists: All TIRS v 6.71

MANDATORY Processes

Rnk	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Statsless	%Checksum	Worst	High Limit	Low Limit
59	CJ0625099	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	300	0	0	0.00%	88.33%	0	7.6	10.4	7.6
60	CJ0625091	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	295	0	0	0.00%	99.93%	0	7.6	10.4	7.6
61	CJ0625100	REAR BRAKE TUBE TO BACKING PLATE L/S	295	0	0	0.00%	43.37%	0	14.8	20.2	14.8
62	CJ0625101	REAR BRAKE TUBE TO BACKING PLATE R/H SAMYO	295	0	0	0.00%	95.59%	0	14.8	20.2	14.8
63	CJ0630030	ASSMB R SEC REAR BRAKE TUBES TO HOSES -	305	0	0	0.00%	36.07%	0	12.3	17.7	12.3
64	CJ0630031	ASSMB L SEC REAR BRAKE TUBES TO HOSES -	305	0	0	0.00%	37.70%	0	12.4	17.7	12.3
65	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	290	0	0	0.00%	6.90%	0	11.5	20.9	11.3
66	CJ2310100	MACHINE ABS HYD VALVE TO SIDERAIL	290	0	0	0.00%	20.69%	0	25.6	34.3	25.5
67	CJ2330140	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		18.6	11.6
68	CJ2330180	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE	290	0	0	0.00%	27.59%	0	14.8	20.2	14.8
69	CJ2450090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	290	0	0	0.00%	34.48%	0	8.9	15.9	8.9
70	CJ2450070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
71	CJ2530100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	305	0	0	0.00%	9.84%	0	94.1	168.2	94.1
72	CJ2530101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	305	0	0	0.00%	9.84%	0	99.5	168.2	94.1
73	CJ2521100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		138.3	97.7
74	CJ2640090	SEC FRONT BRAKE HOSE TO CALIPER - L/S	310	0	0	0.00%	20.97%	0	46.7	63.3	46.7
75	CJ2640091	SEC FRONT BRAKE HOSE TO CALIPER - R/S	305	0	0	0.00%	13.11%	0	46.9	63.3	46.7
76	CJ2640100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/S	290	0	0	0.00%	34.14%	0	9.5	16.5	9.5
77	CJ2640101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/S	290	0	0	0.00%	34.48%	0	9.5	16.6	8.5
78	CK2100060	MULTI-SPINDLE ENGINE FUEL FILLER PIPE TO BODY	300	0	0	0.00%	35.00%	0	3.0	5.1	3.0
79	CK2000050	ASSM FUEL TANK TO UNDERBOT (20 GALLON)	305	0	0	0.00%	32.79%	0	48.4	54.7	40.3
80	CK2020060	ASSM FUEL TANK TO UNDERBOT (25 GALLON)	305	0	0	0.00%	21.31%	0	48.3	54.7	40.3
81	CK2500070	INSTALL RETURN HOSE CLAMP	305	0	0	0.00%	13.11%	0	2.0	5.2	2.0
82	CK2500220	INSTALL FUEL FILLER CLAMP	285	0	0	0.00%	14.75%	0	1.7	4.5	1.1
83	CK1400060	ACCEL BRKT & RET SPRING TO ENG. 3.4L	80	0	0	0.00%	38.00%	0	12.7	17.3	12.7
84	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	280	0	0	0.00%	12.50%	0	113.7	153.8	113.0
85	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/S MULTI-SPINDLE	280	0	0	0.00%	14.29%	0	113.8	153.0	113.0
86	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/S (ALUM.) MULTI-SPINDLE	280	0	0	0.00%	0.00%	0	107.1	159.0	98.0
87	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/S (ALUM.) MULTI-SPINDLE	280	0	0	0.00%	3.57%	0	108.9	159.0	98.0
88	CK2500100	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOL Spec change: 12/19/96	40	0	0	0.00%	37.50%	0	28.1	45.0	27.0

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 11/01/96 - 11/30/96 Dept: All
Shift: All Shifts Class: All
Type: All
Zone: All
Oper: All
Car: All
Rdrs: All
Line: All
Printed on 12/13/96, 11:17 AM
TIBS v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Reviews	Checksum	Worst	High Limit	Low Limit
59	CJ0425090	ASS. REAR JOUNCE HOSE ASY. TO BACKING PL	330	0	0	0.00%	50.00%	0	7.6	19.4	7.6
60	CJ0425091	ASS. REAR JOUNCE HOSE ASY. TO BACKING PL	330	0	0	0.00%	13.03%	0	7.6	19.4	7.6
61	CJ0423100	REAR BRAKE TUBE TO BACKING PLATE L/H	330	0	0	0.00%	42.42%	0	14.8	20.2	14.8
62	CJ0423101	REAR BRAKE TUBE TO BACKING PLATE R/H	330	0	0	0.00%	31.82%	0	14.8	20.2	14.8
63	CJ0430050	ASSMB-4 REC REAR BRAKE TUBES TO HOSES -	330	0	0	0.00%	20.79%	0	12.3	17.7	12.3
64	CJ0430051	ASSMB 5 REC REAR BRAKE TUBES TO HOSES -	330	0	0	0.00%	26.05%	0	12.3	17.7	12.3
65	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS MTG MANU	320	0	0	0.00%	7.81%	0	11.7	20.9	11.3
66	CJ2310100	ENCLOSE ABS MTG VALVE TO SIDERAIL	320	0	0	0.00%	21.88%	0	29.6	34.5	25.5
67	CJ2330140	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2430140	0	0	0	0.00%	0.00%	0		18.6	11.6
68	CJ2330180	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE	320	0	0	0.00%	29.69%	0	14.9	20.2	14.8
69	CJ2430090	REC FRONT BRAKE TUBES TO MASTER CYLINDER	320	0	0	0.00%	28.75%	0	8.9	15.9	8.9
70	CJ2430070	REC FRONT BRAKE TUBES TO JUNCTION BLOCK Includes CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
71	CJ2320180	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	330	0	0	0.00%	15.15%	0	94.4	168.2	94.1
72	CJ2320101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	330	0	0	0.00%	4.55%	0	94.4	168.2	94.1
73	CJ2321100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		138.3	97.7
74	CJ2640090	REC FRONT BRAKE HOSE TO CALIPER - L/H	330	0	0	0.00%	19.70%	0	46.7	63.3	46.7
75	CJ2640091	REC FRONT BRAKE HOSE TO CALIPER - R/H	330	0	0	0.00%	27.27%	0	46.7	63.3	46.7
76	CJ2640100	REC FRONT BRAKE HOSE TO BRAKE TUBE - L/H	320	0	0	0.00%	20.31%	0	9.7	16.5	9.5
77	CJ2640101	REC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	320	0	0	0.00%	37.50%	0	9.6	16.6	9.5
78	CX0100040	SECURE FUEL FILLER PIPE TO BODY	340	0	0	0.00%	22.06%	0	3.8	5.1	3.0
79	CX0290250	ASSM FUEL TANK TO UNDERBDY (20 GALLON)	330	0	0	0.00%	25.76%	0	48.3	54.7	40.3
80	CX0290260	ASSM FUEL TANK TO UNDERBDY (25 GALLON)	330	0	0	0.00%	15.64%	0	48.3	54.7	40.3
81	CX0300070	INSTALL RETURN HOSE CLAMP	330	0	0	0.00%	12.12%	0	2.0	3.2	2.0
82	CX0300230	INSTALL FUEL FILLER CLAMP	330	0	0	0.00%	9.09%	0	1.8	4.9	1.1
83	CX1400040	ACCEL RECT & RET SPRING TO ENG. 3.0L	330	0	0	0.00%	40.91%	0	12.7	17.3	12.7
84	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/H MULTI-SPINDLE	320	0	0	0.00%	7.81%	0	113.0	153.8	113.0
85	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/H MULTI-SPINDLE	320	0	0	0.00%	15.63%	0	114.6	153.0	113.0
86	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/H (ALUM.) MULTI-SPINDLE	320	0	0	0.00%	0.00%	0	103.2	159.8	92.0
87	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/H (ALUM.) MULTI-SPINDLE	320	0	0	0.00%	0.00%	0	97.5	159.0	92.8
88	CH2000180	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOL	330	0	0	0.00%	22.73%	0	34.4	50.6	34.3

New 96

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Dates: 10/01/96 - 10/31/96 Dept: All
Shifts: All Shifts Class: All
Type: All
Zone: All
Super: All
Cars: All
Trks: All
Lists: All
Printed on 12/12/96, 10:12 AM
TIRS v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	Skew	Mistakes	Checksum	Worst	High Limit	Low Limit
59	CJ0601021	SEC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		60.5	59.5
60	CJ0625090	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	370	0	0	0.00%	54.05%	0	7.6	10.4	7.6
61	CJ0625091	ASS. REAR JOUNCE HOSE BRK. TO BACKING PL	370	0	0	0.00%	67.57%	0	7.6	10.4	7.6
62	CJ0625900	REAR BRAKE TUBE TO BACKING PLATE L/R	370	0	0	0.00%	58.11%	0	14.8	20.2	14.8
63	CJ0625901	REAR BRAKE TUBE TO BACKING PLATE R/H	370	0	0	0.00%	52.70%	0	14.8	20.2	14.8
64	CJ0650030	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	370	0	0	0.00%	25.68%	0	12.3	17.7	12.3
65	CJ0650031	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	370	0	0	0.00%	28.38%	0	12.4	17.7	12.3
66	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	360	0	0	0.00%	4.17%	0	11.3	20.9	11.3
67	CJ2510100	ORIFICE ABS HYD VALVE TO SIDERAIL	360	0	0	0.00%	5.56%	0	25.9	34.5	25.3
68	CJ2530140	ASS. RR FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2530140	0	0	0	0.00%	0.00%	0		18.6	11.6
69	CJ2530180	ASS. RR FRT BRAKE TUBE TO TUBE BUNDLE	360	0	0	0.00%	27.78%	0	14.8	20.2	14.8
70	CJ2630090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	369	0	0	0.00%	19.19%	1	9.0	19.9	8.9
71	CJ2650070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2530140	0	0	0	0.00%	0.00%	0		20.2	14.8
72	CJ2520180	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	370	0	0	0.00%	9.46%	0	94.9	160.2	96.1
73	CJ2530181	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	370	0	0	0.00%	10.92%	0	95.5	160.2	96.1
74	CJ2521180	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.3	97.7
75	CJ2640090	SEC FRONT BRAKE HOSE TO CALIPER - L/H	370	0	0	0.00%	28.38%	0	46.7	63.3	46.7
76	CJ2640091	SEC FRONT BRAKE HOSE TO CALIPER - R/H	370	0	0	0.00%	28.38%	0	46.7	63.3	46.7
77	CJ2640100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/H	360	0	0	0.00%	12.50%	0	10.0	16.3	9.5
78	CJ2640101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	360	0	0	0.00%	34.72%	0	10.0	16.6	9.5
79	CJ0100060	ENGINE FUEL FILLER PIPE TO BODY	360	0	0	0.00%	10.28%	0	5.0	5.1	5.0
80	CJ0200050	ASSM FUEL TANK TO UNDERBODY (20 GALLON)	370	0	0	0.00%	44.59%	0	48.5	54.7	48.3
81	CJ0200060	ASSM FUEL TANK TO UNDERBODY (25 GALLON)	370	0	0	0.00%	31.08%	0	48.4	54.7	48.3
82	CJ0500070	INSTALL RETURN HOSE CLAMP	370	0	0	0.00%	29.73%	0	2.0	5.8	2.0
83	CJ0500200	INSTALL FUEL FILLER CLAMP	370	0	0	0.00%	22.97%	0	1.2	4.3	1.1
84	CJ1400060	ACCEL BRKT & RET SPRING TO ENG. 3.0L	370	0	0	0.00%	45.95%	0	12.7	17.3	12.7
85	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/H MULTI-SPINDLE	360	0	0	0.00%	9.72%	0	114.0	153.0	113.0
86	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/H MULTI-SPINDLE	360	0	0	0.00%	20.83%	0	113.7	153.0	113.0
87	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/H (ALUM.) MULTI-SPINDLE	360	0	0	0.00%	1.39%	0	102.7	159.0	98.0
88	CL7900083	TIRE & WHEEL ASST. TO VEH. R/H (ALUM.) MULTI-SPINDLE	360	0	0	0.00%	1.39%	0	109.1	159.0	98.0

not %

ER83-004 0015

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 09/01/96 - 09/30/96 Dept: All
Shifts: All Shifts Class: All
Type: All
Zone: All
Buyer: All
Car: All
Maker: All
Line: All
Printed on 10/02/96, 12:04 AM
TIBB v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rotation	Checksum	Worst	High Limit	Low Limit
38	CJ0601021	SEC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		60.5	59.5
39	CJ0625090	ASS. REAR JOURCE HOSE SNK. TO BACKING PL	395	0	0	0.00%	56.96%	0	7.6	10.4	7.6
60	CJ0625091	ASS. REAR JOURCE HOSE SNK. TO BACKING PL	395	0	0	0.00%	59.49%	0	7.6	10.4	7.6
61	CJ0625100	REAR BRAKE TUBE TO BACKING PLATE L/S	395	0	0	0.00%	49.37%	0	14.8	20.2	14.8
62	CJ0625101	REAR BRAKE TUBE TO BACKING PLATE R/H BANYO	395	0	0	0.00%	39.24%	0	14.6	20.2	14.8
63	CJ0650030	ASSMB A SEC REAR BRAKE TUBES TO HOSES -	395	0	0	0.00%	13.92%	0	12.3	17.7	12.3
64	CJ0650031	ASSMB A SEC REAR BRAKE TUBES TO HOSES -	395	0	0	0.00%	73.92%	0	12.3	17.7	12.3
65	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	410	0	0	0.00%	25.61%	0	11.3	20.9	11.3
66	CJ2310100	SECURE ABS HYD VALVE TO SIDERAIL	410	0	0	0.00%	14.63%	0	30.0	34.5	25.5
67	CJ2330140	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2456140	0	0	0	0.00%	0.00%	0		18.6	17.4
68	CJ2330150	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE	405	0	0	0.00%	27.16%	0	16.8	20.2	16.8
69	CJ2430090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	410	0	0	0.00%	39.27%	0	9.4	13.9	5.9
70	CJ2450070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
71	CJ2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	395	0	0	0.00%	6.33%	0	95.5	148.2	96.1
72	CJ2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	399	0	0	0.00%	2.53%	0	96.4	148.2	96.1
73	CJ2521100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.3	97.7
74	CJ2640090	SEC FRONT BRAKE HOSE TO CALIPER - L/S	395	0	0	0.00%	31.65%	0	46.7	63.3	46.7
75	CJ2640091	SEC FRONT BRAKE HOSE TO CALIPER - R/S	395	0	0	0.00%	30.38%	0	46.7	63.3	46.7
76	CJ2640100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/S	405	0	0	0.00%	28.40%	0	9.7	16.5	9.5
77	CJ2640101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/S MULTI-SPINDLE	405	0	0	0.00%	29.40%	0	9.7	16.6	9.5
78	CK0100060	SECURE FUEL FILLER PIPE TO BODY	385	0	0	0.00%	0.00%	0	3.0	5.1	3.0
79	CK0200250	ASSM FUEL TANK TO UNDERBODY (20 GALLON)	395	0	0	0.00%	38.38%	0	48.3	54.7	48.3
80	CK0820060	ASSM FUEL TANK TO UNDERBODY (25 GALLON)	395	0	0	0.00%	29.11%	0	48.6	54.7	48.3
81	CK0900070	INSTALL RETURN HOSE CLAMP	395	0	0	0.00%	22.78%	0	2.8	5.2	2.0
82	CK0900220	INSTALL FUEL FILLER CLAMP	395	0	0	0.00%	18.99%	0	1.2	4.5	1.1
83	CK1400060	ACCEL REST & REF SPRING TO BKG. 3.0L	395	0	0	0.00%	35.44%	0	18.7	17.3	12.7
84	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	405	0	0	0.00%	4.94%	0	113.0	153.0	113.0
85	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/S MULTI-SPINDLE	405	0	0	0.00%	9.88%	0	113.6	153.0	113.0
86	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/S (ALUM.) MULTI-SPINDLE	405	0	0	0.00%	0.00%	0	105.1	159.0	92.0
87	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/S (ALUM.) MULTI-SPINDLE	405	0	0	0.00%	1.23%	0	102.2	159.0	92.0

Sept. 96

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 08/01/96 - 08/31/96 Dept: All Cars: All Printed on
Shift: All Shifts Class: All Zone: All Xdcr: All 09/05/96, 10:08 AM
Type: All Buyer: All List: All TIRR v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rejects	Checksum	Worst	High Limit	Low Limit
59	CJ0683000	ASS. REAR JOUNCE HOSE ASY. TO BACKING PL	400	0	0	0.00%	42.50%	0	7.6	18.4	7.6
60	CJ0633001	ASS. REAR JOUNCE HOSE ASY. TO BACKING PL	400	0	0	0.00%	41.25%	0	7.6	18.4	7.6
61	CJ0623100	REAR BRAKE TUBE TO BACKING PLATE L/H	400	0	0	0.00%	33.75%	0	14.8	20.2	14.8
62	CJ0623101	REAR BRAKE TUBE TO BACKING PLATE R/H AUTO	400	0	0	0.00%	32.50%	0	14.8	20.2	14.8
63	CJ0650039	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	400	0	0	0.00%	19.00%	0	12.4	17.7	12.3
64	CJ0650031	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	400	0	0	0.00%	25.75%	0	12.3	17.7	12.3
65	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	390	0	0	0.00%	28.51%	0	11.6	20.9	11.3
66	CJ2210180	SECURE ABS HYD VALVE TO SIDERAIL	390	0	0	0.00%	19.23%	0	28.2	34.5	25.5
67	CJ2330140	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2450140	0	0	0	0.00%	0.00%	0		18.6	11.6
68	CJ2330180	ASS. RH FRT BRAKE TUBE TO TUBE BUNDLE	390	0	0	0.00%	44.87%	0	14.8	20.2	14.8
69	CJ2430090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	390	0	0	0.00%	47.44%	0	9.1	15.9	8.9
70	CJ2450070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2330140	0	0	0	0.00%	0.00%	0		20.2	14.8
71	CJ2320100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	400	0	0	0.00%	3.75%	0	99.1	168.2	94.1
72	CJ2320101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	400	0	0	0.00%	5.00%	0	95.6	168.2	94.1
73	CJ2321100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		152.3	97.7
74	CJ2640090	SEC FRONT BRAKE HOSE TO CALIPER - L/H	400	0	0	0.00%	41.25%	0	46.7	65.3	46.7
75	CJ2640091	SEC FRONT BRAKE HOSE TO CALIPER - R/H	400	0	0	0.00%	36.25%	0	46.7	65.3	46.7
76	CJ2648100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/H	390	0	0	0.00%	28.21%	0	9.7	16.5	9.5
77	CJ2648101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	390	0	0	0.00%	26.92%	0	10.3	18.6	9.5
78	CK0100040	ASSEMBLE FUEL FILLER PIPE TO BODY	420	0	0	0.00%	0.00%	0	3.0	5.1	3.0
79	CK0000050	ASSM FUEL TANK TO UNDERBODY (20 GALLON)	400	0	0	0.00%	30.00%	0	40.3	54.7	40.3
80	CK0000060	ASSM FUEL TANK TO UNDERBODY (25 GALLON)	400	0	0	0.00%	30.00%	0	40.3	54.7	40.3
81	CK0500070	INSTALL RETURN HOSE CLAMP	400	0	0	0.00%	18.75%	0	2.0	5.2	2.0
82	CK0500080	INSTALL FUEL FILLER CLAMP	400	0	0	0.00%	20.00%	0	1.2	4.5	1.1
83	CK1400040	ASSEMBLE BRKT & SET SPRING TO ENG. 3.0L	400	0	0	0.00%	47.50%	0	12.7	17.3	12.7
84	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/H MULTI-SPINDLE	390	0	0	0.00%	16.67%	0	115.1	153.0	113.0
85	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/H MULTI-SPINDLE	390	0	0	0.00%	14.10%	0	114.5	153.0	113.0
86	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/H (ALUM.) MULTI-SPINDLE	390	0	0	0.00%	2.56%	0	107.5	139.8	92.0
87	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/H (ALUM.) MULTI-SPINDLE	390	0	0	0.00%	2.56%	0	106.2	139.0	92.0
88	CK0000100	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOLD	400	0	0	0.00%	53.75%	0	34.3	50.6	34.3

Mod 96

ER03-004 0817

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 06/01/96 - 06/30/96 Dept: All Cars: All Printed on
Shift: All Shifts Class: All Zone: All Xdcr: All 07/17/96, 7:53 AM
Type: All Super: All Line: All Time v 6.71

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rotation	%Backup	Worst	High Limit	Low Limit
59	CJ0601027	SEC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		80.5	59.5
60	CJ0602099	ASM. REAR JOUNCE HOSE BRK. TO BACKING PL	400	0	0	0.00%	68.75%	0	7.6	10.4	7.6
61	CJ0602091	ASM. REAR JOUNCE HOSE BRK. TO BACKING PL	400	0	0	0.00%	58.75%	0	7.6	10.4	7.6
62	CJ0603100	REAR BRAKE TUBE TO BACKING PLATE L/S	400	0	0	0.00%	22.50%	0	15.1	20.2	14.8
63	CJ0603101	REAR BRAKE TUBE TO BACKING PLATE R/H SAVIO	400	0	0	0.00%	28.00%	0	14.8	20.2	14.8
64	CJ0650090	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	400	0	0	0.00%	12.50%	0	12.3	17.7	12.3
65	CJ0650091	ASSMB & SEC REAR BRAKE TUBES TO HOSES -	400	0	0	0.00%	10.75%	0	12.3	17.7	12.3
66	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	400	0	0	0.00%	15.00%	0	11.4	20.9	11.3
67	CJ2310180	SECURE ABS HYD VALVE TO SIDERAIL	400	0	0	0.00%	13.75%	0	26.5	34.8	25.8
68	CJ2320140	ASS. RR PRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2650140	0	0	0	0.00%	0.00%	0		18.6	11.6
69	CJ2320160	ASS. RR PRT BRAKE TUBE TO TUBE BUNDLE	400	0	0	0.00%	37.50%	0	14.8	20.2	14.8
70	CJ2630090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	400	0	0	0.00%	32.50%	0	9.2	15.9	8.9
71	CJ2650070	SEC FRONT BRAKE TUBES TO JUNCTION BLOCK INCLUDES CJ2320140	0	0	0	0.00%	0.00%	0		20.2	14.8
72	CJ2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	400	0	0	0.00%	3.00%	0	99.1	148.2	84.1
73	CJ2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	400	0	0	0.00%	1.25%	0	99.2	148.2	96.1
74	CJ2521100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.5	97.7
75	CJ2640090	SEC FRONT BRAKE HOSE TO CALIPER - L/S	400	0	0	0.00%	33.75%	0	46.7	63.3	46.7
76	CJ2640091	SEC FRONT BRAKE HOSE TO CALIPER - R/S	400	0	0	0.00%	35.00%	0	46.7	63.3	46.7
77	CJ2640100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/S	400	0	0	0.00%	27.00%	0	9.5	16.5	9.3
78	CJ2640101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/S MULTI-SPINDLE	400	0	0	0.00%	12.50%	0	9.6	16.6	9.3
79	CJ0100060	SECURE FUEL FILLER PIPE TO BODY	400	0	0	0.00%	13.75%	0	3.0	5.1	3.0
80	CJ0800250	ASSM FUEL TANK TO UNDERBDY (20 GALLON)	400	0	0	0.00%	33.00%	0	48.9	54.7	40.3
81	CJ0800260	ASSM FUEL TANK TO UNDERBDY (25 GALLON)	400	0	0	0.00%	27.50%	0	48.3	54.7	40.3
82	CJ0800070	INSTALL RETURN HOSE CLAMP	400	0	0	0.00%	30.00%	0	2.0	5.2	2.0
83	CJ0800080	INSTALL FUEL FILLER CLAMP	400	0	0	0.00%	21.25%	0	1.4	4.5	1.1
84	CJ1400060	ACCEL BRKT & RET SPRING TO ENG. 3.0L	400	0	0	0.00%	37.50%	0	12.7	17.3	12.7
85	CL7900080	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	350	0	0	0.00%	16.67%	0	113.3	153.0	113.0
86	CL7900081	TIRE AND WHEEL ASS. TO VEHICLE R/S MULTI-SPINDLE	350	0	0	0.00%	10.61%	0	113.4	153.0	113.0
87	CL7900082	TIRE & WHEEL ASSY. TO VEH. L/S (ALUM.) MULTI-SPINDLE	350	0	0	0.00%	0.00%	0	107.3	139.0	92.0
		Spec change: 06/06/96									
88	CL7900083	TIRE & WHEEL ASSY. TO VEH. R/S (ALUM.) MULTI-SPINDLE	350	0	0	0.00%	1.52%	0	111.1	139.0	92.0
		Spec change: 06/06/96									

June 96

OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

Date: 05/01/96 - 05/31/96 Dept: All Cars: All Printed on
Shift: All Shifts Cimcor: All Zones: All Xdcr: All 06/05/96, 11:08 AM
Type: All Ropers: All Limit: All TIRE v 6.77

MANDATORY Processes

Rank	Process Number	Process Description	Data Points: Total	High	Low	%Low	%Rotation	%Breakaway	Worst	High Limit	Low Limit
58	CJ0601000	REC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		80.5	59.5
59	CJ0601001	REC REAR WHEEL ASSEMBLY TO REAR AXLE BACKUP	0	0	0	0.00%	0.00%	0		80.5	59.5
60	CJ0623000	ASS. REAR JOUNCE HOSE ASS. TO BACKING PL	420	0	0	0.00%	59.52%	0	7.6	10.4	7.6
61	CJ0623001	ASS. REAR JOUNCE HOSE ASS. TO BACKING PL	420	0	0	0.00%	54.76%	0	7.6	10.4	7.6
62	CJ0623100	REAR BRAKE TUBE TO BACKING PLATE L/S	420	0	0	0.00%	30.95%	0	14.8	20.2	14.8
63	CJ0623101	REAR BRAKE TUBE TO BACKING PLATE R/H EMYD	420	0	0	0.00%	23.81%	0	14.8	20.2	14.8
64	CJ0650030	ASSMB S REC REAR BRAKE TUBES TO HOSES -	420	0	0	0.00%	28.34%	0	12.4	17.7	12.3
65	CJ0650031	ASSMB S REC REAR BRAKE TUBES TO HOSES -	420	0	0	0.00%	16.67%	0	12.3	17.7	12.3
66	CJ2300070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODU	430	0	0	0.00%	12.79%	0	11.4	20.9	11.3
67	CJ2319100	MACHINE ASM HYD VALVE TO SIDERAIL	430	0	0	0.00%	9.30%	0	26.6	34.5	25.5
68	CJ2320140	ASS. RF PRT BRAKE TUBE TO TUBE BUNDLE INCLUDES CJ2650140	250	0	0	0.00%	22.00%	0	11.6	18.6	11.6
69	CJ2330100	ASS. RF PRT BRAKE TUBE TO TUBE BUNDLE	100	0	0	0.00%	33.34%	0	14.8	20.2	14.8
70	CJ2430090	REC FRONT BRAKE TUBES TO MASTER CYLINDER	430	0	0	0.00%	34.88%	0	9.3	15.9	8.9
71	CJ2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	430	0	0	0.00%	4.79%	0	94.9	148.2	94.1
72	CJ2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE	430	0	0	0.00%	7.14%	0	97.4	148.2	94.1
73	CJ2521100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE BACKUP	0	0	0	0.00%	0.00%	0		132.3	97.7
74	CJ2640090	REC FRONT BRAKE HOSE TO CALIPER - L/S	430	0	0	0.00%	39.29%	0	46.7	65.8	46.7
75	CJ2640091	REC FRONT BRAKE HOSE TO CALIPER - R/S	420	0	0	0.00%	56.52%	0	46.7	65.8	46.7
76	CJ2640100	REC FRONT BRAKE HOSE TO WHEEL TUBE - L/S	430	0	0	0.00%	10.46%	0	9.5	16.5	9.5
77	CJ2640101	REC FRONT BRAKE HOSE TO BRAKE TUBE - R/S MULTI-SPINDLE	430	0	0	0.00%	16.05%	0	9.5	16.6	9.5
78	CM0100060	SECURE FUEL FILLER PIPE TO BODY	420	0	0	0.00%	15.48%	0	3.0	5.1	3.0
79	CM0200250	ASSM FUEL TANK TO UNDBODY (20 GALLON)	420	0	0	0.00%	20.99%	0	40.3	54.7	40.3
80	CM0200260	ASSM FUEL TANK TO UNDBODY (25 GALLON)	420	0	0	0.00%	29.76%	0	40.4	54.7	40.3
81	CM0500070	INSTALL RETURN HOSE CLAMP	420	0	0	0.00%	26.90%	0	2.0	5.2	2.0
82	CM0500280	INSTALL FUEL FILLER CLAMP	420	0	0	0.00%	17.86%	0	1.1	4.5	1.1
83	CM1400060	ACCEL INLET & RET SPRING TO ENG. 3.0L	420	0	0	0.00%	84.76%	0	12.7	17.3	12.7
84	CL7900060	TIRE AND WHEEL ASS. TO VEHICLE L/S MULTI-SPINDLE	430	0	0	0.00%	12.79%	0	113.7	155.0	113.0
85	CL7900061	TIRE AND WHEEL ASS. TO VEHICLE R/S	430	0	0	0.00%	24.42%	0	113.4	153.0	113.0
86	CM0000100	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOL	430	0	0	0.00%	25.71%	0	34.4	50.6	34.3
87	CM0100140	ASSEMBLE INLET PIPE/HEADMATOR TO MANIFOL	420	0	0	0.00%	17.86%	0	34.5	51.4	31.4
88	CM0000090	ASSEMBLE GASKET AND FLEX COUPLING TO Y-P	430	0	0	0.00%	19.77%	0	34.0	46.8	34.0
89	CM0000110	ASSEMBLE GASKET AND FLEX COUPLING TO M/F	430	0	0	0.00%	4.65%	0	36.5	50.3	35.9

Tires

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ORVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

01/01/96 - 01/31/96, Both Shifts

MANDATORY Processes

Rank	Process Number	Process Description	Data Points Total	Data Points Hi	Data Points Lo	Data Points %Lo	Data Points Total	Data Points Hi	Data Points Lo	Data Points %Lo	Mean	Hi Limit	Lo Limit
38	CJ8021866	AIR/ABS. BOOSTER TO MASTER CYL. (MANUAL) MANUAL OPERATION	44	0	0	0.00	220	0	0	0.00	23.3	35.4	23.7
39	CJ8100186	BOOSTER & BRAKE SUPP. TO DASH PANEL. (4 NUT	44	0	0	0.00	220	0	0	0.00	14.1	29.7	15.9
40	CJ8100200	BOOSTER & BRAKE SUPP. TO DASH PANEL. (2 BOL	44	0	0	0.00	220	0	0	0.00	26.3	31.9	24.3
41	CJ8310000	ABS. BRAKE TUBE TO PROPORTIONING VALVE	49	0	0	0.00	245	0	0	0.00	11.3	18.3	11.3
42	CJ8330080	ASMBL LF REAR BRAKE TUBE TO TUBE BUNDLE	49	0	0	0.00	245	0	0	0.00	11.5	18.5	11.5
43	CJ8330070	ASMBL RH REAR BRAKE TUBE TO TUBE BUNDLE SANYO - AIRPLANE RUN	49	0	0	0.00	245	0	0	0.00	12.4	18.5	11.5
44	CJ8423006	ABS. REAR JOUNCE HOSE ASM. TO BACKING PLATE	46	0	0	0.00	230	0	0	0.00	7.6	10.4	7.6
45	CJ8423091	ABS. REAR JOUNCE HOSE ASM. TO BACKING PLATE	46	0	0	0.00	230	0	0	0.00	7.6	10.4	7.6
46	CJ8423100	REAR BRAKE TUBE TO BACKING PLATE L/R	46	0	0	0.00	230	0	0	0.00	14.8	20.2	14.8
47	CJ8423101	REAR BRAKE TUBE TO BACKING PLATE R/H SANYO	46	0	0	0.00	230	0	0	0.00	14.8	20.2	14.8
48	CJ8450020	ASSMB 2 SEC REAR BRAKE TUBES TO HOSES - L/R	47	0	0	0.00	235	0	0	0.00	13.8	17.7	12.3
49	CJ8450031	ASSMB 2 SEC REAR BRAKE TUBES TO HOSES - R/H	47	0	0	0.00	235	0	0	0.00	12.4	17.7	12.3
50	CJ2300070	SEC-ASSEMBLE BRAKE TUBES TO ABS HYD MODULE	50	0	0	0.00	250	0	0	0.00	12.8	20.9	11.3
51	CJ2310100	SECURE ABS HYD VALVE TO SIDERAIL	49	0	0	0.00	245	0	0	0.00	25.8	34.5	25.5
52	CJ2330140	ASSEMBLE RR PRT BRAKE TUBE TO JUNCTION BLOC INCLUDES CJ8460140	49	0	0	0.00	245	0	0	0.00	12.2	18.4	11.4
53	CJ2430090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	49	0	0	0.00	245	0	0	0.00	8.9	18.4	8.9
54	CJ2430070	SECURE BRAKE TUBES TO JUNCTION BLOCK. INCLUDES CJ2330140	49	0	0	0.00	245	0	0	0.00	11.7	16.4	11.4
55	CJ2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE L/R	44	0	0	0.00	220	0	0	0.00	98.3	148.2	96.1
56	CJ2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE R/H	48	0	0	0.00	240	0	0	0.00	98.4	148.2	96.1
57	CJ2540090	SEC FRONT BRAKE HOSE TO CALIPER - L/R	48	0	0	0.00	240	0	0	0.00	46.7	63.3	46.7
58	CJ2540091	SEC FRONT BRAKE HOSE TO CALIPER - R/H	48	0	0	0.00	240	0	0	0.00	46.7	63.3	46.7
59	CJ2540100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/R	49	0	0	0.00	245	0	0	0.00	9.5	16.5	9.5
60	CJ2540101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	49	0	0	0.00	245	0	0	0.00	10.5	16.6	9.8
61	CX0100060	SECURE FUEL FILLER PIPE TO BODY	44	0	0	0.00	220	0	0	0.00	3.0	3.1	3.0
62	CX0300200	ASSM FUEL TANK TO UNDERBDY (20 GALLON)	47	0	0	0.00	235	0	0	0.00	40.3	54.7	40.3
63	CX0300260	ASSM FUEL TANK TO UNDERBDY (25 GALLON)	47	0	0	0.00	235	0	0	0.00	40.3	54.7	40.3
64	CX0500070	INSTALL RETURN HOSE CLAMP	47	0	0	0.00	235	0	0	0.00	2.1	3.3	2.0
65	CX0500320	INSTALL FUEL FILLER CLAMP	47	0	0	0.00	235	0	0	0.00	1.7	4.9	1.1
66	CL7900060	TIRE AND WHEEL ASS. TO VEHICLE L/R MULTI-SPINDLE	46	0	0	0.00	230	0	0	0.00	113.3	133.0	113.0
67	CL7900061	TIRE AND WHEEL ASS. TO VEHICLE R/H	46	0	0	0.00	230	0	0	0.00	115.4	133.0	113.0
68	CX2000100	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOLD	46	0	0	0.00	230	0	0	0.00	34.3	38.6	34.3
69	CX2100140	ASSEMBLE INLET PIPE/RESONATOR TO MANIFOLD	46	0	0	0.00	230	0	0	0.00	31.5	31.4	31.4
70	CX2000090	ASSEMBLE GASKET AND FLEX COUPLING TO Y-PIPE	46	0	0	0.00	230	0	0	0.00	34.2	46.0	34.0
71	CX2000110	ASSEMBLE GASKET AND FLEX COUPLING TO MUFFLE	46	0	0	0.00	230	0	0	0.00	36.6	38.2	35.9
72	CX2065130	HOOD LATCH ASSEMBLY TO CENTER END SUPT	46	0	0	0.00	230	0	0	0.00	10.2	13.8	10.2
73	DT1160050	TRANSAXLE OUTER CONTROL LEVER TO AXLE TRANS	46	0	0	0.00	230	0	0	0.00	10.5	14.7	10.5
74	DT1400100	SHIFT CABLE BRKT TO AXLE TRANS.	46	0	0	0.00	230	0	0	0.00	19.8	32.8	19.2
75	D02560100	14305 TO ALTERNATOR CONNECTIONS (3.8L)	46	0	0	0.00	230	0	0	0.00	6.8	9.2	6.8

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OAKVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report
02/01/96 - 02/29/96, Both Shifts

MANDATORY Processes

Rank	Process Number	Process Description	Data Sets Total	Data Sets Hi	Data Sets Lo	Data Sets Rbo	Data Points Total	Data Points Hi	Data Points Lo	Data Points Rbo	Mean	Hi Limit	Lo Limit
38	CJA0201040	BJB/ABS. BOOSTER TO MASTER CYL. (MANUAL) MANUAL OPERATION	44	0	0	0.00	320	0	0	0.00	25.7	35.4	23.7
39	CJA108100	BOOSTER & BRACE ASSY. TO DASH PANEL. (4 BOT	44	0	0	0.00	320	0	0	0.00	19.9	29.7	19.9
40	CJA108200	BOOSTER & BRACE ASSY. TO DASH PANEL. (2 BOL	44	0	0	0.00	320	0	0	0.00	24.3	31.9	24.3
41	CJA2316000	ASM. BRAKE TUBE TO PROPORTIONING VALVE	44	0	0	0.00	320	0	0	0.00	11.5	18.5	11.5
42	CJA2330000	ASMBL LH REAR BRAKE TUBE TO TUBE BUNDLE	44	0	0	0.00	320	0	0	0.00	11.7	18.5	11.5
43	CJA2330070	ASMBL RH REAR BRAKE TUBE TO TUBE BUNDLE SANYO - AIRPLANE RUN	44	0	0	0.00	320	0	0	0.00	11.9	18.5	11.5
44	CJA6420040	ASM. REAR JOUNCE HOSE ENK. TO BACKING PLATE	44	0	0	0.00	320	0	0	0.00	7.6	10.4	7.6
45	CJA6420071	ASM. REAR JOUNCE HOSE ENK. TO BACKING PLATE	44	0	0	0.00	320	0	0	0.00	7.6	10.4	7.6
46	CJA6421100	REAR BRAKE TUBE TO BACKING PLATE L/H	44	0	0	0.00	320	0	0	0.00	14.8	20.2	14.8
47	CJA6421101	REAR BRAKE TUBE TO BACKING PLATE R/H SANYO	44	0	0	0.00	320	0	0	0.00	14.8	20.2	14.8
48	CJA6450030	ASSMB & SEC REAR BRAKE TUBES TO HOSES - L/H	44	0	0	0.00	320	0	0	0.00	12.3	17.7	12.3
49	CJA6450031	ASSMB & SEC REAR BRAKE TUBES TO HOSES - R/H	44	0	0	0.00	320	0	0	0.00	12.3	17.7	12.3
50	CJA2300070	SEC-ASSEMBLE BRAKE TUBES TO ABS MTD MODALE	44	0	0	0.00	320	0	0	0.00	11.5	20.9	11.5
51	CJA2310100	SECURE ABS MTD VALVE TO SHOCKRAIL	44	0	0	0.00	320	0	0	0.00	20.7	34.5	20.9
52	CJA2330140	ASSEMBLE RH REAR BRAKE TUBE TO JUNCTION BLOC INCLUDES CJA6490140	44	0	0	0.00	320	0	0	0.00	12.1	18.6	11.6
53	CJA2430000	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	44	0	0	0.00	320	0	0	0.00	6.9	15.9	8.9
54	CJA2430070	SECURE BRAKE TUBES TO JUNCTION BLOCK. INCLUDES CJA2330140	44	0	0	0.00	320	0	0	0.00	12.5	18.4	11.6
55	CJA2520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE L/H	44	0	0	0.00	320	0	0	0.00	94.2	168.2	94.1
56	CJA2520101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE R/H	44	0	0	0.00	320	0	0	0.00	94.1	168.2	94.1
57	CJA2540090	SEC FRONT BRAKE HOSE TO CALIPER - L/H	44	0	0	0.00	320	0	0	0.00	44.9	65.3	44.7
58	CJA2540091	SEC FRONT BRAKE HOSE TO CALIPER - R/H	44	0	0	0.00	320	0	0	0.00	44.7	65.3	44.7
59	CJA2540100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/H	44	0	0	0.00	320	0	0	0.00	9.5	14.5	9.5
60	CJA2540101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	44	0	0	0.00	320	0	0	0.00	9.5	14.6	9.5
61	CK0100040	SECURE FUEL FILLER PIPE TO BODY	44	0	0	0.00	320	0	0	0.00	3.8	5.1	3.8
62	CK0300250	ASSM FUEL TANK TO UNDERBDY (20 GALLON)	44	0	0	0.00	320	0	0	0.00	44.4	54.7	40.3
63	CK0300260	ASSM FUEL TANK TO UNDERBDY (25 GALLON)	44	0	0	0.00	320	0	0	0.00	41.0	54.7	40.3
64	CK0300870	INSTALL RETURN HOSE CLAMP	44	0	0	0.00	320	0	0	0.00	2.0	5.2	2.0
65	CK0300220	INSTALL FUEL FILLER CLAMP	44	0	0	0.00	320	0	0	0.00	1.8	4.5	1.1
66	CL7900040	TIRE AND WHEEL ASS. TO VEHICLE L/H MULTI-SPINDLE	44	0	0	0.00	320	0	0	0.00	113.1	153.0	113.0
67	CL7900041	TIRE AND WHEEL ASS. TO VEHICLE R/H	44	0	0	0.00	320	0	0	0.00	113.0	153.0	113.0
68	CM2300100	ASSEMBLE CAT. CONV/INLET PIPE TO MANIFOLD	44	0	0	0.00	320	0	0	0.00	34.3	38.6	34.3
69	CM2300140	ASSEMBLE INLET PIPE/RESONATOR TO MANIFOLD	44	0	0	0.00	320	0	0	0.00	31.4	31.4	31.4
70	CM2900090	ASSEMBLE GASKET AND FLEX COUPLING TO Y-PIPE	44	0	0	0.00	320	0	0	0.00	35.8	44.8	34.6
71	CM2900110	ASSEMBLE GASKET AND FLEX COUPLING TO MUFFLE	44	0	0	0.00	320	0	0	0.00	35.9	38.3	35.9
72	CM2907120	BEND LATCH ASSEMBLY TO CENTER BAR SUPT	44	0	0	0.00	320	0	0	0.00	10.2	13.8	10.2
73	DT1100050	TRANSAXLE OUTER CONTROL LEVER TO A540 TRANS	44	0	0	0.00	320	0	0	0.00	10.5	14.7	10.5
74	DT1400100	SHIFT CABLE ASSY TO A540 TRANS.	44	0	0	0.00	320	0	0	0.00	19.3	32.5	19.2
75	EE2300100	14305 TO ALTERNATOR CONNECTIONS (3.8L)	44	0	0	0.00	320	0	0	0.00	6.8	9.2	6.8

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ONEVILLE ASSEMBLY PLANT
Torque Inspection Report
Process Ranking Summary Report

03/01/96 - 03/31/96, Both Shifts

SUMMATORY Processes

Rank	Process Number	Process Description	Data Sets Total	Hi	Lo	%Lo	Data Points Total	Hi	Lo	%Lo	Worst	Hi Limit	Lo Limit
39	CJ0100190	BOOSTER & BRAKE SUPP. TO DASH PANEL. (4 NUT	81	0	0	0.00	405	0	0	0.00	16.4	29.7	15.9
40	CJ0100200	BOOSTER & BRAKE SUPP. TO DASH PANEL. (2 BOL	81	0	0	0.00	405	0	0	0.00	24.3	31.9	24.3
41	CJ0210090	ASM. BRAKE TUBE TO PROPORTIONING VALVE	82	0	0	0.00	410	0	0	0.00	11.5	18.5	11.5
42	CJ0220080	ASMBL LH REAR BRAKE TUBE TO TUBE BUNDLE	82	0	0	0.00	410	0	0	0.00	11.6	18.5	11.5
43	CJ0220070	ASMBL RH REAR BRAKE TUBE TO TUBE BUNDLE EAVY - AIRPLANE GLU	82	0	0	0.00	410	0	0	0.00	11.5	18.5	11.5
44	CJ0423090	ASS. REAR JOUNCE BOSE BRK. TO BACKING PLATE	79	0	0	0.00	395	0	0	0.00	7.6	10.4	7.6
45	CJ0423091	ASS. REAR JOUNCE BOSE BRK. TO BACKING PLATE	79	0	0	0.00	395	0	0	0.00	7.6	10.4	7.6
46	CJ0425100	REAR BRAKE TUBE TO BACKING PLATE L/H	79	0	0	0.00	395	0	0	0.00	14.6	20.2	14.6
47	CJ0425101	REAR BRAKE TUBE TO BACKING PLATE R/H EAVY	79	0	0	0.00	395	0	0	0.00	14.6	20.2	14.6
48	CJ0450020	ASSMB & SEC REAR BRAKE TUBES TO HOSES - L/H	80	0	0	0.00	400	0	0	0.00	12.3	17.7	12.3
49	CJ0450021	ASSMB & SEC REAR BRAKE TUBES TO HOSES - R/H	80	0	0	0.00	400	0	0	0.00	12.3	17.7	12.3
50	CJ0500070	SUB-ASSEMBLE BRAKE TUBES TO ABS HYD MODULE	82	0	0	0.00	410	0	0	0.00	11.6	20.9	11.5
51	CJ0510100	SECURE ABS HYD VALVE TO SIDERAIL	82	0	0	0.00	410	0	0	0.00	25.6	34.3	25.5
52	CJ0530140	ASSEMBLE RH FRT BRAKE TUBE TO JUNCTION BLOC INCLUDES CJ0450140	82	0	0	0.00	410	0	0	0.00	12.7	18.6	11.6
53	CJ0530090	SEC FRONT BRAKE TUBES TO MASTER CYLINDER	82	0	0	0.00	410	0	0	0.00	8.9	15.9	8.9
54	CJ0450070	SECURE BRAKE TUBES TO JUNCTION BLOCK. INCLUDES CJ0530140	82	0	0	0.00	410	0	0	0.00	12.2	18.6	11.6
	CJ0520100	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE L/H	80	0	0	0.00	400	0	0	0.00	97.2	168.2	96.1
56	CJ0560101	ASSEMBLE FRONT CALIPER TO FRONT KNUCKLE R/H	80	0	0	0.00	400	0	0	0.00	99.2	168.2	96.1
57	CJ0640090	SEC FRONT BRAKE HOSE TO CALIPER - L/H	80	0	0	0.00	400	0	0	0.00	46.7	63.3	46.7
58	CJ0640091	SEC FRONT BRAKE HOSE TO CALIPER - R/H	80	0	0	0.00	400	0	0	0.00	46.7	63.3	44.7
59	CJ0640100	SEC FRONT BRAKE HOSE TO BRAKE TUBE - L/H	82	0	0	0.00	410	0	0	0.00	9.8	16.5	9.5
60	CJ0640101	SEC FRONT BRAKE HOSE TO BRAKE TUBE - R/H MULTI-SPINDLE	82	0	0	0.00	410	0	0	0.00	9.4	14.6	9.5
61	CX0100060	SECURE FUEL FILLER PIPE TO BODY	80	0	0	0.00	400	0	0	0.00	3.0	5.1	3.0
62	CX0200080	ASSM FUEL TANK TO CROSSMBT (20 GALLON)	80	0	0	0.00	400	0	0	0.00	40.3	54.7	40.3
63	CX0220080	ASSM FUEL TANK TO CROSSMBT (25 GALLON)	80	0	0	0.00	400	0	0	0.00	40.3	54.7	40.3
64	CX0500070	INSTALL RETURN HOSE CLAMP	80	0	0	0.00	400	0	0	0.00	2.0	3.2	2.0
65	CX0500220	INSTALL FUEL FILLER CLAMP	80	0	0	0.00	400	0	0	0.00	1.3	4.5	1.1
66	CL7900049	TIRE AND WHEEL ASS. TO VEHICLE L/H MULTI-SPINDLE	82	0	0	0.00	410	0	0	0.00	113.7	153.0	113.0
67	CL7900061	TIRE AND WHEEL ASS. TO VEHICLE R/H	82	0	0	0.00	410	0	0	0.00	114.2	153.0	113.0
68	CX2000100	ASSEMBLE EXT. CONV/INLET PIPE TO MANIFOLD	79	0	0	0.00	395	0	0	0.00	34.4	50.4	34.3
69	CX2100140	ASSEMBLE INLET PIPE/RESONATOR TO MANIFOLD	79	0	0	0.00	395	0	0	0.00	31.4	51.4	31.4
70	CX2000090	ASSEMBLE GASKET AND FLEX COUPLING TO Y-PIPE	82	0	0	0.00	410	0	0	0.00	35.5	46.0	34.0
71	CX2000110	ASSEMBLE GASKET AND FLEX COUPLING TO MUFFLE	82	0	0	0.00	410	0	0	0.00	35.9	50.3	33.9
72	CX2005120	HOOD LATCH ASSEMBLY TO CENTER RAD SUPT	82	0	0	0.00	410	0	0	0.00	10.2	13.5	10.2
73	DT1960050	TRANSAXLE OUTER CONTROL LEVER TO AX4S TRANS	79	0	0	0.00	395	0	0	0.00	10.6	14.7	10.5
74	DT1480100	SHIFT CABLE BRKT TO AX4S TRANS.	79	0	0	0.00	395	0	0	0.00	19.0	32.5	19.2
75	XM2500100	14305 TO ALTERNATOR CONNECTIONS (3.8L)	79	0	0	0.00	395	0	0	0.00	6.8	9.3	6.8
76	XM4510000	INSTALL HOOD SENSORS (blue sensors) GLICKER WASHER	80	0	0	0.00	400	0	0	0.00	29.8	46.3	29.7

TRANSMISSION VERIFICATION REPORT

TIME : 03/05/1997 09:42
NAME : [illegible] PLANT
FAX : [illegible]
TEL : [illegible]

DATE,TIME	03/05 09:34
FAX NO./NAME	[illegible]
DURATION	00:00:02
PAGE(S)	01
RESULT	OK
MODE	STANDARD ECM

DA03-004 0523

Operating Procedure
Vehicle Operations
Ford Motor Company

No: VOPFAG241
Date: October 30, 1998

SUBJECT: Torque Integrity Assurance Program for Assembly Plants
Procedure VOPFAG241.

VOPFAG241 provides revised and updated direction for performance of the Torque Integrity Assurance Program. This 10/30/98 revision replaces the 2/26/98 issue. The revisions are indicated by a vertical line in the left margin or by the use of italic letters.

The significant changes are in Sections:

I. Definitions

II. Setting up Operations, including flow charts

III. Torque Process Potential Studies, including flow charts

IV. Dynamic Torque Surveillance, including flow charts

VII. Torque Auditing Route Development

IX. Record Retention

APPENDIX A Torque Inspection and Studies Systems Data Analysis flow chart.

Please refer any questions on this Procedure to R.G. Varto (RVARTO).

Approved by:

Robert G. Varto
Fastening Systems Supervisor
Process Strategies and Plant Interface Department

Ken J. Oswandal
Department Manager,
Process Strategies and Plant Interface Department

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Operating Procedure

VOPFAG241

Vehicle Operations
Ford Motor Company

Issue Date: October 30, 1998
Previous Issue Date: February 26,1998

SUBJECT: **Torque Integrity Assurance Program for Assembly Plants**

PREPARED BY: Process Strategies & Plant Interface Dept., Vehicle Fastening Systems Section

ORGANIZATIONAL COMPONENTS AFFECTED:

Assembly Plants: Fastening Systems Control Activity
Production Departments
Government Regulations Coordinator
Plant Engineering
Manufacturing Engineering
Resident Engineering

General Office: Vehicle Fastening Systems
Global Final Assembly Engineering
Quality Office - Vehicle Operations

Other: Product Engineering

Summary:

This publication is an update of the *February 26,1998* version of Operating Procedure VOPFAG241. This is a GLOBAL procedure. Text changes are indicated by a vertical line in the left margin *or by the use of italic letters.*

VOPFAG241 is a comprehensive guide for handling torque in an assembly plant and is an integral part of the torque control program. This procedure covers torque surveillance, corrective actions, torque process potential studies, torque auditing route development, and required reports. The records are compiled in the "Torque Inspection & Study System (TISS)" which, combined with any additional plant controls, effectively serve as each plant's Torque Control Plan.

The implementation of VOPFAG241 is the joint responsibility of the Assembly Plants Production Department and Fastening Systems Control. Fastening Systems Control is responsible for ongoing torque surveillance and performing Torque Process Potential Studies. Fastening Systems Control is also responsible for power tool allocation and procurement (see PT-6, Handling and Control of Power Tools in Assembly Plants). Production responsibilities include using the correct equipment, using it properly and correcting out-of-specification units. Production and Fastening Systems Control are both responsible for implementing corrective actions.

The foundation of this procedure is the Torque Process Potential Study (TPPS). Analysis of each operation occurs through a Torque Process Potential Study, which aligns the operation to the specification mean, determines its process potential (Pp & Ppk), and sets residual (audit) torque limits. The residual torque limits become the inspection limits for ongoing torque surveillance, when periodic dynamic torque measurement is not possible. The residual limits are used to detect concerns, not to adjust the process.

Wherever possible, dynamic torque is measured and used to shut off the tool through transducer feedback or, simply, to monitor the operation. Dynamic measurement is also used for torque concern analysis. The goal is to drive dynamic torque Cp and Cpk to 1.33 or better.

Any deviation from this procedure must be requested in writing and submitted to Vehicle Fastening Systems, Vehicle Operations General Office (VOGO), for approval.

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I: Definitions

It is necessary to establish a baseline of understanding before continuing in this document. It is important that everyone involved in this program use terms consistently, with regard to definition. This section will define terms used in this document and some statistical terms.

Global Study Process Allocation System (GSPAS) - The Global Study Process Allocation System is being developed and implemented by Vehicle Operations (VO) for defining assembly processes. Users of GSPAS link part information to process steps (elements), tools, and specific usage information to define a complete assembly operation. In the future, GSPAS will replace MPPS as the primary system.

Manufacturing Process Planning System (MPPS) - The Manufacturing Process Planning System is Vehicle Operations (VO) system for defining assembly processes. Users of MPPS link part information to process steps (elements), tools, and specific usage information to define a complete assembly operation. MPPS is the primary system used to transfer assembly process information to the assembly plants.

Mandatory ("M") Operation - A Mandatory operation contains a Critical Characteristic. Critical Characteristics are those product requirements (dimensions, specifications, tests) or process parameters which:

- can affect compliance with government regulations or safe vehicle/product function, and
- require specific producer, assembly, shipping, or monitoring actions.

Include Critical Characteristics on Control Plans. Critical Characteristics are identified with the inverted delta (▽) symbol on Ford drawings, specifications, and Control Plans.

In the MPPS system, an "M" in the "C" field of the Tool screen (PF12) will identify Critical Characteristic operations.

Significant (Warranty) ("S","W") Operation - From Engineering Practice No. 30, "Significant Characteristics are those product, process, and test requirements which are important for Customer Satisfaction and for which Quality Planning action must be summarized on a Control Plan."

In the MPPS system, an "S" in the "C" field of the Tool screen (PF12) will identify Significant Characteristic operations, replacing the current "W" used to designate Warranty operations.

Control Plans - Control Plans are written descriptions of the system for controlling processes producing products for Ford. Producers must establish Control Plans for all new products and must address all Significant and Critical design characteristics, process parameters, and ES tests.

Model Year - This time period is defined from Job #1 of one year to Job#1 of the next year.

Process Failure Mode and Effects Analysis (FMEA) - An FMEA is an analytical technique which uses the potential failure modes of a process and the causes to prioritize improvement opportunities. The FMEA should be treated as a living document that is updated as necessary whenever the process changes.

Torque Process Potential Study - A Torque Process Potential Study (TPPS) is a procedure for examining threaded fastener operations. It aligns an operation to the dynamic specification mean, determines the dynamic process potential and determines the relationship of the dynamic torque to the residual measurement *(sample size is 60 for a full TPPS).*

Mini Torque Process Potential Study - A Mini TPPS has the same definition as the Torque Process Potential Study listed above with exception of the sample size taken. The sample size is reduced from 60 samples (full TPPS) to 30 samples(Mini TPPS).

Priority 1 Fastener - Critical/Mandatory and Significant fasteners, which during pre-Job#1 production builds, have indicated that the residual torque is below the lower dynamic specification limit (or minimum torque if previously specified). (i.e. if the fastener rotates prior to the "click", identify the fastener as Priority 1.)

I: Definitions

Priority 2 Fastener - Critical/Mandatory and Significant fasteners, which during pre-Job#1 production builds, have indicated that the residual torque is higher than the lower dynamic specification limit. (i.e. If the wrench "clicks" before any fastener rotation occurs, identify the fastener as Priority 2.).

Benchmarking - Benchmarking is the process of measuring an operation to establish a base or reference point.

Dynamic Torque - Dynamic torque is the measure of the torque during the securing process. It is measurable only while the fastener is rotating. Installation torque specifications are given as dynamic torque values, in Newton meters (Nm).

Dynamic (Installation) Torque Specification - Product Engineering assigns a dynamic torque specification to every threaded fastener operation, as a target mean and tolerance (variance).

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Residual Torque - - Residual torque is the *measure* of the torque on a secured fastener. It is the value obtained when the fastener begins to rotate in the tightening direction, when measuring with a torque wrench. This was previously known as static torque, which is a misnomer. Static torque is defined below. (See note, page 8)

Residual (Audit/Inspection) Torque Limits - Audit torque is the upper and lower inspection limits allowed for residual torque on a given operation. These limits are either the dynamic specification limits or the residual mean plus or minus 3 sigma (±3σ), as determined by a Torque Process Potential Study (TPPS). The TPPS values take precedence over other defined values when auditing residual torque. A TPPS will be performed to redefine the audit torque limits anytime the process changes.

Static Torque (revised definition) - Static torque is the torque value that exists when a fastener is in a static state (i.e. not moving). There is no method for measuring a static torque value because measurement causes rotation of the fastener, thus, taking it out of the static state.

Minimum Torque - Minimum Torque is the lowest acceptable torque value for a specific joint (i.e. dynamic or residual measurements must be above this value).

This value can be used for attribute inspection (i.e. "is the torque above this value?"). In attribute torque inspection, a click-wrench is set at the minimum torque value and applied to the fastener (in the tightening direction). If the wrench "clicks" before additional rotation occurs, the torque was above the minimum and thus OK. If the wrench "clicks" after additional rotation occurs, the torque was below the minimum and thus NOT OK. In absence of a separately specified minimum torque, the minimum torque is equal to the lower dynamic torque specification. After completion of a TPPS, the minimum torque is equal to the lower value of either the lower residual limit or the lower dynamic torque specification.

Peak Meter - A peak meter is an electronic device for measuring the torque output of a transducer.

Transducer - A transducer is an electronic strain gage that measures torque applied to a fastener.

Portable Joint Simulator - A portable joint simulator imitates threaded fastener joints of different hardness using Belleville washers. Changing the configuration and number of the concave washers changes the torque rate produced. This device is useful for centering a power tool at the dynamic specification mean when using the actual joint is not possible.

Torque Inspection and Studies System (TISS) - The Torque Inspection and Studies System provides an integrated method of setting-up, recording, and reporting assembly process information. The system allows the loading and unloading of data from a DataMyte. The system generates daily and periodic reports.

VM - Virtual Machine (VM) is the main frame computer operating system which contains the PROFS electronic mail system and the Information Center/Enhanced (ICE) data management system.

ICE (Information Center/Enhanced) - The Information Center/Enhanced (ICE) is the mainframe data management system that contains the Torque Process Potential Study databases for each assembly plant.

I: Definitions (continued)

DataMyte System - "DataMyte" is the brand name of a portable data collector that uses electronic measuring devices, such as torque wrenches and transducers, to measure and record data. The DataMyte can analyze the data and print various reports, or transfer the data to a computer for analysis in a larger database.

Peak Mode - This is a programmable setting for the DataMyte to obtain a torque measurement. The operator must apply torque to the fastener until the fastener moves slightly (as little as possible) and then stop rotating. The highest value measured is recorded. All data collectors shall use this mode.

Breakaway Mode - This is also a programmable setting for the DataMyte to obtain a torque measurement. This setting detects the change in applied force versus time and records the peak value measured before the change. The assumption is that the change is the start of fastener rotation. This does not consider other reasons for the change, such as parts deflection or a change in the applied force. Do not use this method for residual torque measurement.

Statistical Terms:

Statistical analysis is used to monitor and improve manufacturing processes. An understanding of statistical methods is necessary to implement this procedure. Seek the help of local statistics experts (i.e. SPC personnel) when using this procedure. The following are brief definitions of common statistical terms. For more information on statistics, refer to the publications listed in Chapter XII, Related Procedures and Documents.

Histogram - A histogram is a vertical bar chart of the frequency of results of a process. The possible results are plotted on the horizontal axis while the frequencies of these results are plotted on the vertical axis.

Individuals Chart - An individuals chart is a simple graphic representation of a characteristic of a process, showing plotted individual values of some statistic (in this case, dynamic torque) gathered from that characteristic, a central line (mean), and one or two control limits. It has two basic uses: as a judgement to determine if a process has been operating in statistical control, and as an operation to aid in maintaining statistical control.

Moving Range Chart - A moving range chart is a simple graphic representation of the range between consecutive individuals on an individuals chart and a center line.

Statistical Control - Statistical control is the condition describing a process in which no special causes of variation exist and only common causes remain. Evidence of this state is the lack of non-randomness (trends) or points outside the control limits of a properly prepared control chart.

Process Stability - A process is said to be stable if it is in statistical control; contains no special causes of variation; is predictable.

Normal Distribution - A continuous, symmetrical, bell-shaped frequency distribution for variables data. A histogram will display a bell-shaped curve if the data used in it is a normal distribution.

Process Potential Study - The purpose of a Process Potential Study is to determine if a process can produce output fit for use. It provides a starting point for achieving statistical control. The study result may be an indicator of the need for process improvement actions.

Process Capability Study - The continuous statistical analysis of a process to identify and eliminate variability from special and common causes.

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E. Definitions (continued)

Pp & Ppk - Pp and Ppk carry the same definitions as Cp and Cpk, respectively, except their calculation is based on data from short-term studies rather than periodic sampling over an extended time. Torque Process Potential Studies use Pp and Ppk.

Common Causes - 1. Those sources of variability in a process that are truly random (i.e. inherent in the process itself). 2. A source of variation that effects all the individual values of the process output.

Special (Assignable) Causes - The sources of variation in a process that are not random. A source of variation that is intermittent, unpredictable and unstable. A point beyond the control limits, a run or other non-random pattern of points within the control limits indicates the existence of a special cause.

Cp (Process Potential) - Cp is an index that is the ratio of the tolerance range to the six sigma process spread without regard to the location of the data. It is calculated after verifying the process is in a state of statistical control.

$$Cp = \frac{\text{Tolerance}}{6\sigma}$$

Cp is an indicator of the ability of the process to stay within the engineering specification. The larger Cp is the more capable the process is of staying within the tolerance. A Cp of 1.33 is considered acceptable.

Cpk (Process Capability) - Cpk is an index that considers both the process spread and the proximity of the process spread to specification limits. It is calculated after verifying the process is in a state of statistical control.

$$Cpk = \text{the lesser of } \frac{(USL - Mean)}{3\sigma} \text{ or } \frac{(Mean - LSL)}{3\sigma}$$

USL - Upper Specification Limit
LSL - Lower Specification Limit

Cpk is an index combining Cp and K to indicate whether the process will produce units within the tolerance limits. It has a value equal to Cp if the process is centered on the mean specification. If Cpk is negative, the process mean is outside the specification limits. If Cpk is between 0 and 1, then some of the 6 sigma spread falls outside the tolerance limits. If Cpk is larger than 1, the 6 sigma spread is completely within the tolerance limits.

Note: Residual torque data is not to be used to calculate Cp & Cpk (or Pp & Ppk) indices, as they may not reflect the dynamic capability of the process.

Acronyms

CR/CR - Concern Report/Change Report
FSC - Fastening System Control
MPPS - Manufacturing Process Planning System
GSPAS - Global Study Process Allocation System
PE - Product Engineering
TIAP - Torque Integrity Assurance Program
TISS - Torque Inspection & Study System
TPPS - Torque Process Potential Study
TOPS - Team Oriented Problem Solving
VM - Virtual Machine (type of IBM mainframe computers Ford uses)
VOGO - Vehicle Operations General Office (formerly BAGO, Body & Assembly General Office)

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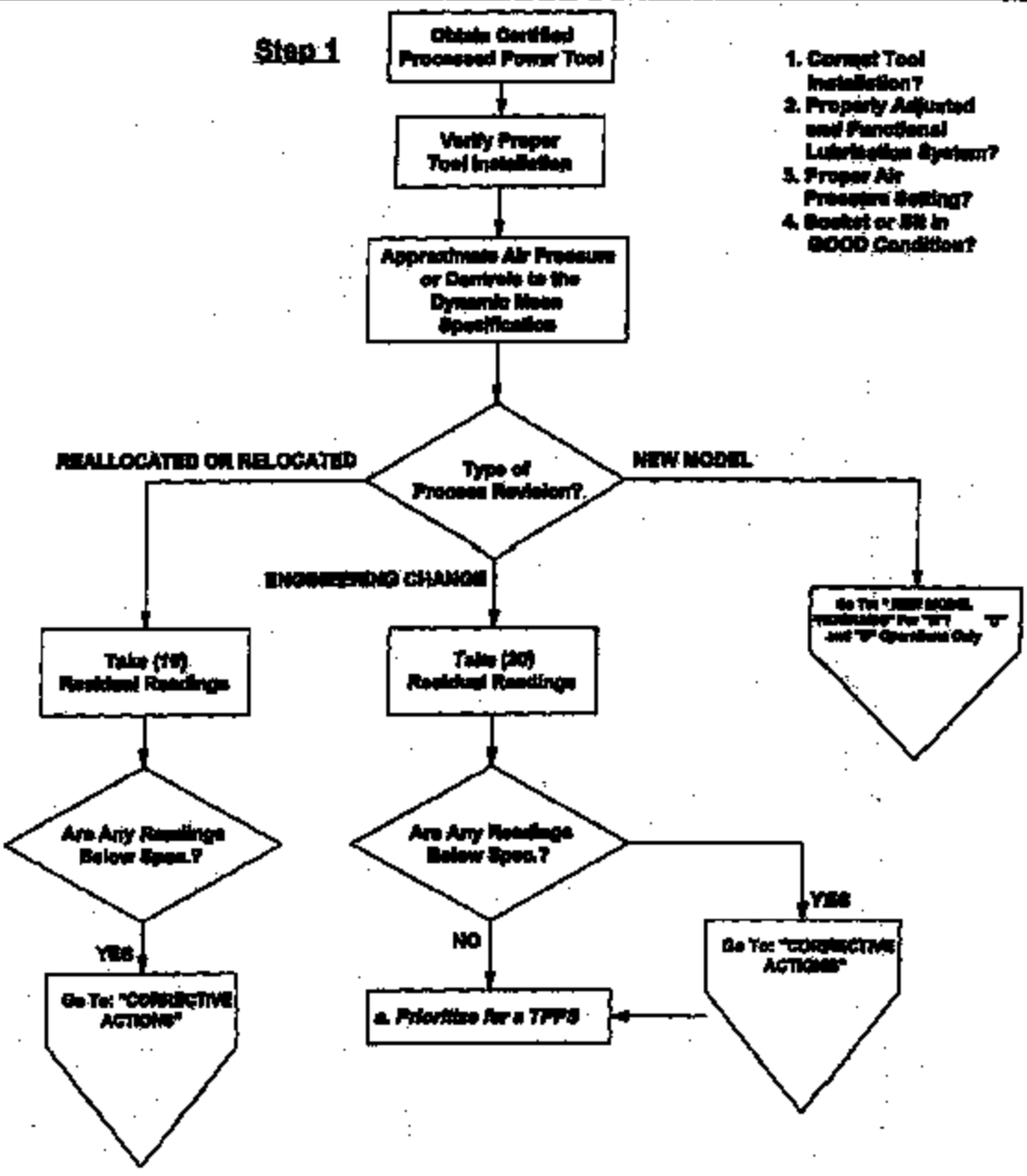
TIAP - Torque Integrity Assurance Program II, A: *Setting Up* Operations



II: *Setting Up* Operations (see flow chart II, A : dated *10/30/98*)

Operations are allocated as required to meet the General Office processing directions shown in the *MPPS/GSPAS computer system. Setting Up* Operations includes *operation set-up, reallocated/relocated operations, engineering changes and new model programs.*

The procedure for installing and adjusting power tools is part of Power Tool Standards PT-5, published by Vehicle Fastening Systems. On all operations, a Ford certified power tool of the correct size must be provided with an installation that meets all applicable Ford standards. Ford certified power tools, installation standards, and power tool standards, including PT-5, may be found in the Portable Power Tool Manual (green three ring binder).

A. *Operation Set-up*

1. Obtain processed power tool size (certified - shape may vary for ergonomics)
2. Assure the tool installation is correctly sized.
3. Make sure lubricator is working.
4. Assure that the socket or bit is in good condition.
5. Approximate air pressure or set controls to get the dynamic mean torque specification.
6. *Prioritize for a Torque Process Potential Study (TPPS).*

B. *Reallocated or Relocated Operations*

1. *Insure the tool is mean centered to the dynamic mean specification.*
2. *Take 10 residual torque samples.*
3. *If any residual torque values from step (2) are below the lower dynamic limit (or lower residual limit if a TPPS has been conducted),* start Corrective Actions (Chapter IV, Section C).

C. *Engineering Changes*

1. *Take 20 residual torque samples.*
   a. *If any residual torque values from step (1) fall below the lower dynamic specification limits,* start Corrective Actions (Chapter IV, Section C).
2. Prioritize for a Torque Process Potential Study (TPPS).

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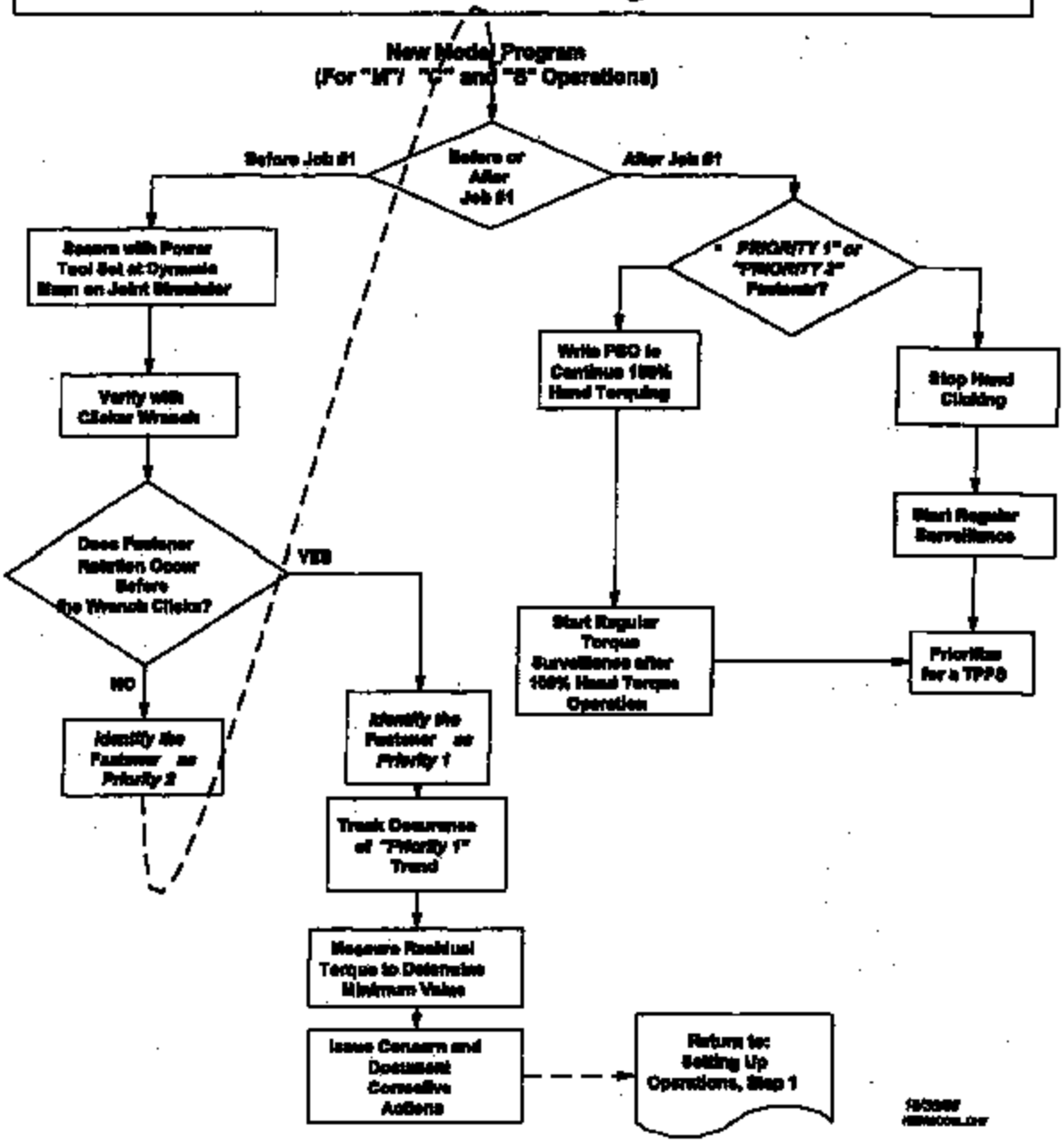
TIAP - Torque Integrity Assurance Program
II, *D: New Model Programs*



D. *New Model Programs (see flow chart II, D; dated 10/30/98)*

1. For Saleable Units prior to Job #1:

a. For all NEW Mandatory/Critical and Significant fasteners, each operator is provided the following tooling:

1. Processed power tool (set at the operating station to the mean dynamic torque specification on a joint simulator).
2. Torque clicker wrench set at the lower dynamic specification unless a minimum torque specification has been given by the PE.

b. Secure the fastener with the processed power tool, assuring that the tool shuts-off properly.

c. Apply the clicker wrench to the secured fastener in the tightening direction until the wrench "clicks".

d. *Using a local process, identify the fasteners as to* one of the following conditions during the hand torque operation:

1. If the wrench "clicks" before any fastener rotation occurs, identify the fastener *as a Priority 2.* This condition indicates that the *residual* torque is at some value greater than the minimum torque.
2. If the fastener rotates prior to the "click", *identify* the fastener *as a Priority 1.* This condition indicates that the *residual* torque was at some value less than the minimum torque but has been tightened to the minimum.

Note: Step (d) provides a means of assuring that ALL Critical and Significant fasteners are audited for the correct torque. All fasteners with low torque are hand torqued to the minimum torque specification. Any fasteners that could potentially create a low torque concern are identified *as Priority 1.*

e. FSC organization tracks occurrences and trends for *fasteners identified as Priority 1.*

1. If no definite trend exists, prioritize the operation for a TPPS after Job #1 when more data will be available for determination of the minimum torque value.
2. If a *Priority 1* trend exists, continue with *step (f).*

f. Verify that the power tool is set to the correct mean torque and that the operator is using the correct tool during the assuring operation.

g. Measure the residual torque to determine the minimum torque value. Determine the source/cause of the relaxation in the joint.

h. Contact the responsible design engineer and request evaluation of the joint. The design engineer has two available options:

1. Release the minimum torque as part of the engineering specification or
2. Redesign the joint to eliminate the relaxation.

i. Issue a CR/CR to document the concern and release the permanent corrective action.

j. Return to step (e) and reset the hand click wrench to the new minimum torque.

D. *New Model Programs* (continued)

2. **After Job #1:**

a. *For all fasteners identified as Priority 2:*

1. Stop the use of hand click wrenches.
2. Start regular torque surveillance (Chapter IV).
3. Prioritize the operation for a TPPS.

b. *For all fasteners identified as Priority 1:*

1. Write an Alert and PSO to continue the 100% hand torque operation.
2. Start regular torque surveillance after the hand torque operation (Chapter IV).
3. Prioritize the operation for a TPPS.

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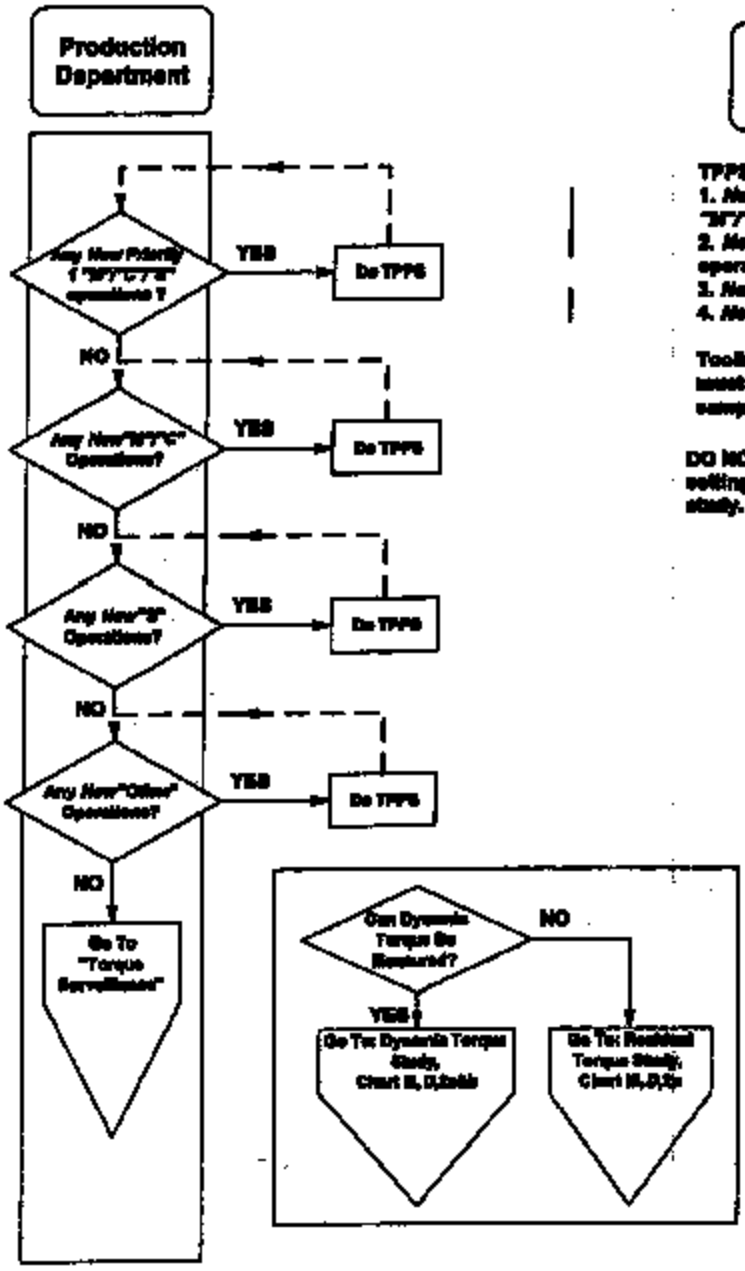
TIAP - Torque Integrity Assurance Program
III, A: TPPS Prioritization



III: Torque Process Potential Studies

The Plant Fastening System Control Group will conduct a TPPS on every threaded fastener operation.

For "New Model Programs", this may require the use of "bubble teams" to temporarily augment the regular TPPS team. Funding for these incremental expenditures must be requested through the regular plant launch budget. This can be accomplished by staying in contact with the Launch Coordinator and informing them of the plants requirements. Approximately 12-18 months prior to Job#1, the manpower requirements (for pre-build and after Job#1 responsibilities) are input into the launch budget. It is important to remember that additional tooling (i.e. DataMyte, transducers, cables, sockets, extensions, etc.) may be needed.

A. *TPPS Prioritization (see flow chart III, A: dated 10/30/98)*

1. *New Critical/Mandatory and Significant fasteners, which during pre-Job#1 production builds, have indicated that the residual torque is below the lower dynamic specification limit (or minimum torque if previously specified).*
2. *New Critical/Mandatory operations which have indicated that the residual torque is higher than the lower dynamic specification limit during pre-Job#1 production builds and Critical/Mandatory Engineering Changes.*
3. *New Significant operations which have indicated that the residual torque is higher than the lower dynamic specification limit during pre-Job#1 production builds.*
4. *New Other (not designated Critical/Mandatory or Significant) operations which have indicated that the residual torque is higher than the lower dynamic specification limit during pre-Job#1 production builds.*

Note: If an operation is causing production problems, it should be pulled ahead for a TPPS.

For New Model changes, per procedure VOPGON-801, 5.6.6, TOOL PROCESS CAPABILITY STUDIES, the Vehicle Operations Manufacturing Engineer will provide a list of the operations that will require a new TPPS to the PSC. For on going Engineering Change Requests, it is imperative that the PVT personnel/Engineering Change Coordinator provide the list to the PSC.

B. *TPPS Completion Requirements*

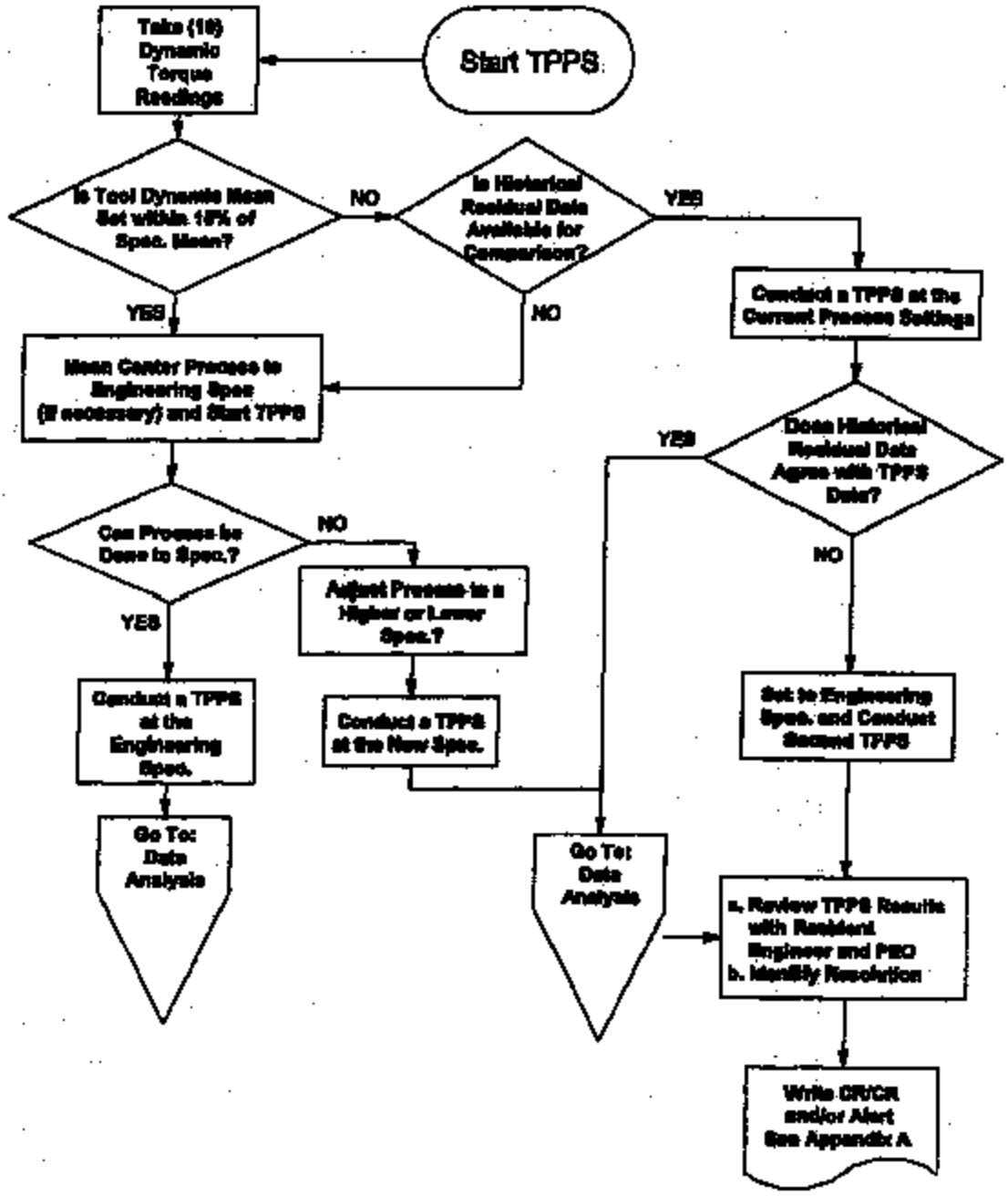
1. *New Critical/Mandatory operations require a full TPPS completed within 3 months of Job#1 or the "Effected In" date of the engineering change.*
2. *New Significant operations require a full TPPS completed within 6 months of Job#1 or the "Effected In" date of the engineering change.*
3. *New Other (not designated Critical/Mandatory or Significant) operations require a MINI TPPS completed within 12 months of Job#1 or the "Effected In" date of the engineering change.*

Exception: All operations that were new or revised with Job#1 dates prior to 9/21/98 will fall under the TPPS completion requirement of Three (3) years for "Other" operations with Mini studies being performed.

NOTE: Once a TPPS has been completed on each threaded fastener operation, a new TPPS will only be required if there is a change to the joint composition or fastening process such as:

- *Fastener finish*
- *Fastener change*
- *Joint component change*
- *Torque Specification*

TIAP - Torque Integrity Assurance Program III, *C*: Benchmarking Current Production



C. Process Benchmarking (see flow chart III, C dated 10/30/98)

When benchmarking a "carryover" operation, the potential exists where the operation is not being performed to the released engineering torque specifications. Past torque concerns on these operations may have been corrected in the plant but the information was never relayed to the PE (Product Engineering) for correction of their engineering releases. In these cases, the FSC must obtain historical inspection data for the operation (if available) along with conducting a TPPS at the current settings and the engineering specifications. The Resident Engineer and/or the PE should be involved in determining whether the existing set-up or the released specification should be used for production based on the TPPS and the historical inspection data. The following procedure should be used when "benchmarking" existing assembly operations:

1. Take (10) dynamic torque readings on the operation at the current tool set-up.
2. Calculate the tool dynamic mean.
   a. If the tool mean is within 15% of the Engineering Specification;
      1. Mean center the tool to the Engineering Specification and begin the TPPS.
         A. If the process can be done at the Engineering Specification, continue with the TPPS at the Engineering Specification.
         B. If the process can not be done at the Engineering Specification, adjust the process mean and continue with the TPPS at the new setting.
      2. Go To Data Analysis, (see section II.B.4) review the TPPS with Resident Engineering and identify resolutions.
   b. If the tool mean is not within 15% of the Engineering Specification, check for historical data on the operation.
      1. If historical data does not exist for the operation, set the process mean to the Engineering Specification and continue with the TPPS. Go to step 2a above.
      2. If historical data does exist, continue with the TPPS at the current tool setting.
3. Compare the TPPS data with the historical data.
   a. If the historical data agrees with the TPPS data, Go To Data Analysis, review the TPPS with Resident Engineering and identify resolutions.
   b. If the historical data does not agree with the TPPS data;
      1. Set the tool to the Engineering Specification
      2. Conduct a second TPPS
      3. Go To Data Analysis, review the TPPS with Resident Engineering and identify resolutions.

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III: *Torque Process Potential Studies*

D. Conducting a TPPS

The Torque Process Potential Study (TPPS) is a procedure for benchmarking threaded fastener operations. Its purpose is to align an operation to the dynamic mean specification and to establish residual torque limits for monitoring the operation.

Measuring dynamic torque for each securing cycle requires coupling a transducer between the power tool and the socket (except when a transducer is built into the tool). This will not be possible for every process, due to accessibility concerns or tool design. Therefore, there are three basic study formats:

- Dynamic & Residual Torque Study - Dynamic torque is measurable during the securing cycle.
- Residual Torque Study with Dynamic Mean Adjustment - Dynamic torque is measurable at the operation only on a joint simulator.

Mandatory/Critical operations must be studied by one of the above TPPS formats.

- Residual Torque Study - Dynamic torque is not measurable at the operation.

Non-Mandatory/Critical operations may be studied using any of the above TPPS formats. Whenever possible, use a method that measures dynamic torque.

1. Initial TPPS Setup

   a. Fill in the background information portion of the TPPS worksheet (Appendix B).
      1. Use the latest process sheet or data from MPPS/GSPAS.
      2. Sketch the operations with more than one fastener or if needed for clarity.

   b. Verify that the tooling set-up is correct and in proper working order.
      1. Certified tool (listed in the Power Tool Manual)
      2. Transducer (dynamic studies only)
      3. Transducer readout (dynamic studies only)
      4. Tool size (ref. process sheet)
      5. Tool type (stall, air shutoff, clutch)
      6. Hose length
      7. Hose diameter
      8. Pressure gage
      9. Regulator
      10. Lubrication (oil level and function)

      Do not conduct a study unless these items are present and in proper working order.

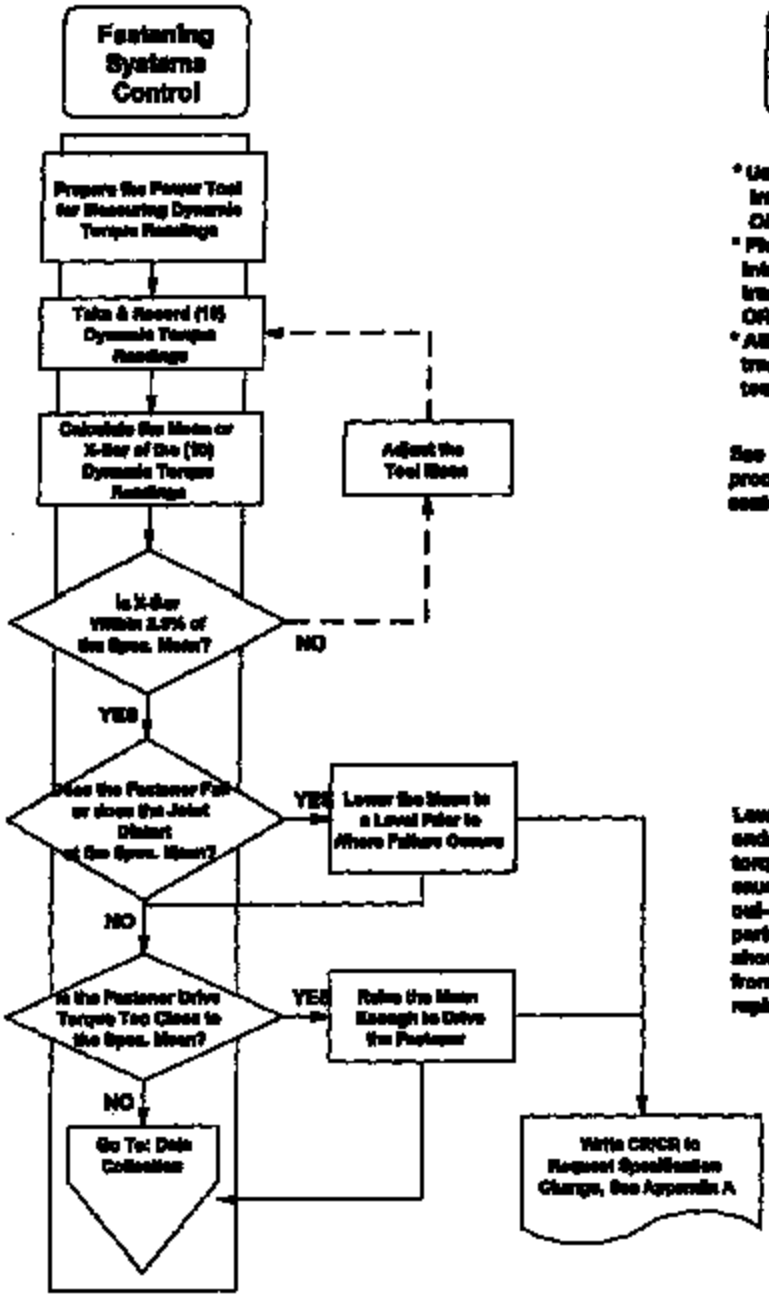
   c. Explain the TPPS to the operator and why it is being performed.

      Note: It is important that no units are missed by the operator, during the set up and conducting of the study. If the study interferes with production, help the operator keep up.

   d. Make sure the operator is using the tool correctly, not...
      1. Releasing tool trigger before tool shutoff.
      2. Double triggering.
      3. Creating a side load during rundown.

   e. Number multiple spindles and fasteners to segregate dynamic and residual data with the corresponding spindle and fastener. Studies done on multiple fastener operations are to include 50 data samples of both dynamic and residual torque for each fastener.

TIAP - Torque Integrity Assurance Program III, *D*, 2a: Dynamic & Residual Torque Study



D. Conducting a TPPS (continued)

2. Power Tool Setup

a. Dynamic & Residual Torque Study (see flow chart III, D, 2a; dated 10/30/98)

Use the Dynamic & Residual Torque Study method to determine the capability of the process. Perform it on all operations where both dynamic and residual torque are measurable. Additionally, use this procedure on operations where the tool can be set dynamically, but where dynamic measurement of the fastener is not possible.

1. Prepare the tool to measure torque by one of the following methods:
   a. Use the tool's transducer readout
   b. Plug in a peak meter to the internal transducer
   c. Attach an external transducer to the tool. Use a DataStyle, in peak mode, to read the transducer.
2. Tape all wires out of the operators way.
3. Record at least ten (10) rundowns on the operation before making any adjustments.
   a. Calculate the average of the readings.

      $$\frac{\text{Sum of the Samples}}{\text{The Number of Samples}} = \text{Sample Average}$$

   b. Calculate the difference from the dynamic mean specification (target mean) to the measured average (tool mean).

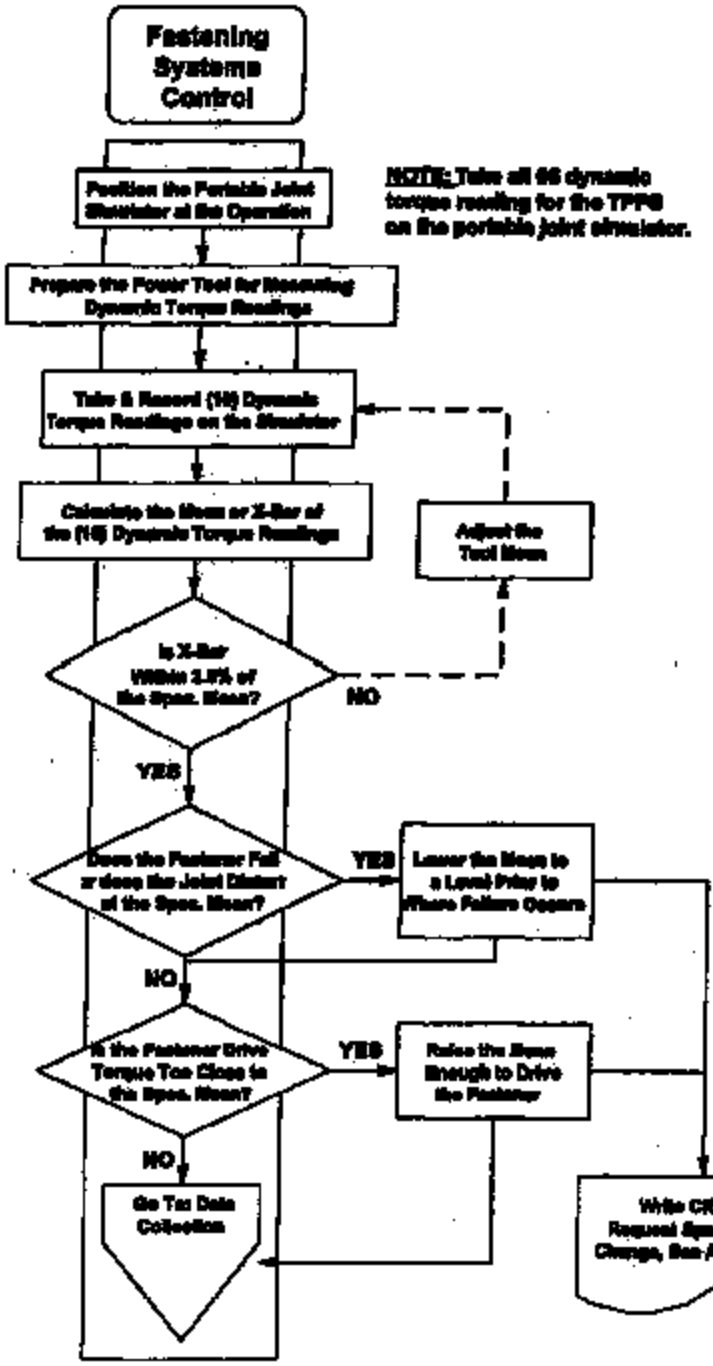
      $$\frac{\text{Tool Mean} - \text{Target Mean}}{\text{Target Mean}} \times 100\% = \text{Percent Deviation}$$

   c. The tool mean should be within +/- 2½% of the target mean. If the tool mean is greater than 2½%, adjust the tooling to reduce the deviation. Repeat step (3) until the tool mean is within 2½% of the target mean. If it is not possible to get close to the 2½% target, replace the tool and/or regulator. Repeat step (3) until the tool mean is within 2½% of the target mean.
4. Observe each securing cycle and record any discrepancies.
   a. If the dynamic specification fails the fastener or abnormally distorts the joint, lower the tool mean to a point below where fastener failure or joint distortion occurs.
   b. If the drive torque is too close to the dynamic mean specification (i.e. the tool stops before driving the fastener all the way in), raise the tool mean enough to drive the fastener.

Note: The above discrepancies may be caused by out-of-specification parts and new stock may correct the problem. Out-of-specification stock must be removed from the production line and held for disposition. If out-of-specification parts are not the cause, write a CR/CR requesting the release of the torque specification developed in this TPPS. The Resident Engineer should release an Alert, specifying interim actions, including the torque specification developed in this study.
(See Appendix A, Concern Resolution Submission Forms, CR/CR Form #2 - Request for New Torque Specification)

c. Perform the TPPS at the new torque level.

TIAP - Torque Integrity Assurance Program III, *D*, 2b: Resid. Torque Study w/ Dyn. Mean Adjust.



2. Power Tool Setup (continued)

b. Residual Torque Study with Dynamic Mean Adjustment (see flow chart III, *D*, 2b: dated 10/30/98)

Use the residual torque study with dynamic mean adjustment method on operations where dynamic measurement is only possible using a joint simulator. For this study, follow the Dynamic And Residual Torque Study procedure with the following revisions:

1. Position the portable joint simulator so the power tool can reach it (without removing the tool from the operation).

2. Couple a transducer with hex adapter to the simulator. The hex adapter must be the same size as the socket on the power tool. This will permit torque sampling while the operator is not using the tool to secure fasteners, without changing the tool configuration.

3. Adjust the tool to the mean of the specification as outlined in step (3) of the Dynamic and Residual Torque Study.

4. Observe each securing cycle and record any discrepancies as outlined in step (4) of the Dynamic and Residual Torque Study.

A. If dynamic data can not be taken with the production tool because it is fixtured, use a "slave" tool to determine the correlating residual mean. Adjustments to the production tool are made using the residual comparator of the slave tool. See section (a) in Data Analysis for identification of the study method in the VMI system.

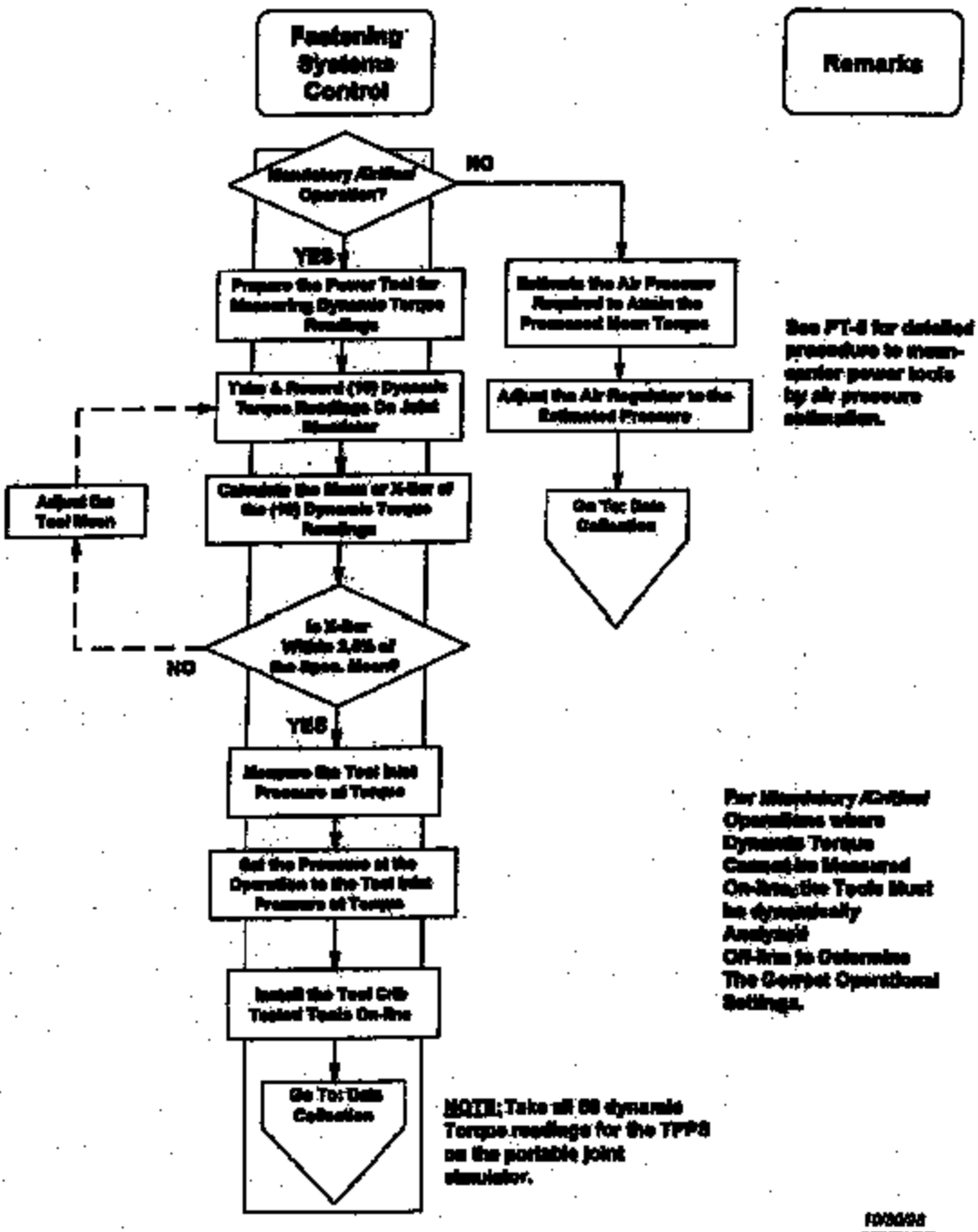
B. For operations where a "click" wrench is used to secure (or final secure) the fastener, the TPPS shall be completed as follows:

a. Set "click" wrench to the dynamic specification mean on the joint simulator - use off-set cal value if needed. (See Chapter VII, Section C, Torque Auditing Route Development, Off-sets)

b. Collect "dynamic" data from operator using "click" wrench on joint simulator before each securing cycle.

c. TPPS technicians will loosen the joint simulator between cycles to assure that there is rotation for the dynamic measurement.

TIAP - Torque Integrity Assurance Program III, *D*, 2c: Residual Torque Study



2. Power Tool Setup (continued)

c. Residual Torque Study (see flow chart III, *D*, 2c: dated 10/30/98)

Use the Residual Torque Study method only on non-Mandatory/Critical operations and when dynamic torque measurement is not possible at the operation. That is, when a power tool without a built-in transducer, is fixtured in such a way that attaching an external transducer to it is not possible. If residual data shows that the torque is not within the specification, establish the proper power tool settings off line through dynamic torque measurement.

1. Estimate the pressure required to obtain the specification mean.

2. Adjust the air regulator to the pressure estimated in step (1).

PT-8, chapter II, How to Set-up a New Operation, covers this procedure in detail.

For Mandatory/Critical operations where dynamic torque cannot be measured on-line, the tools must be dynamically analyzed off-line to determine the correct operational settings. These settings will then be used on the operation. Use the following methods:

1. Tool setups in the tool crib must mirror the operation as closely as possible.

2. Use the portable joint simulator to simulate the joint.

3. Make at least 10 rundowns, measuring the dynamic torque with an external transducer. Adjust the tool to within 2½% of the dynamic specification mean (use the same process as step (3) in the Dynamic & Residual Torque Study Method).

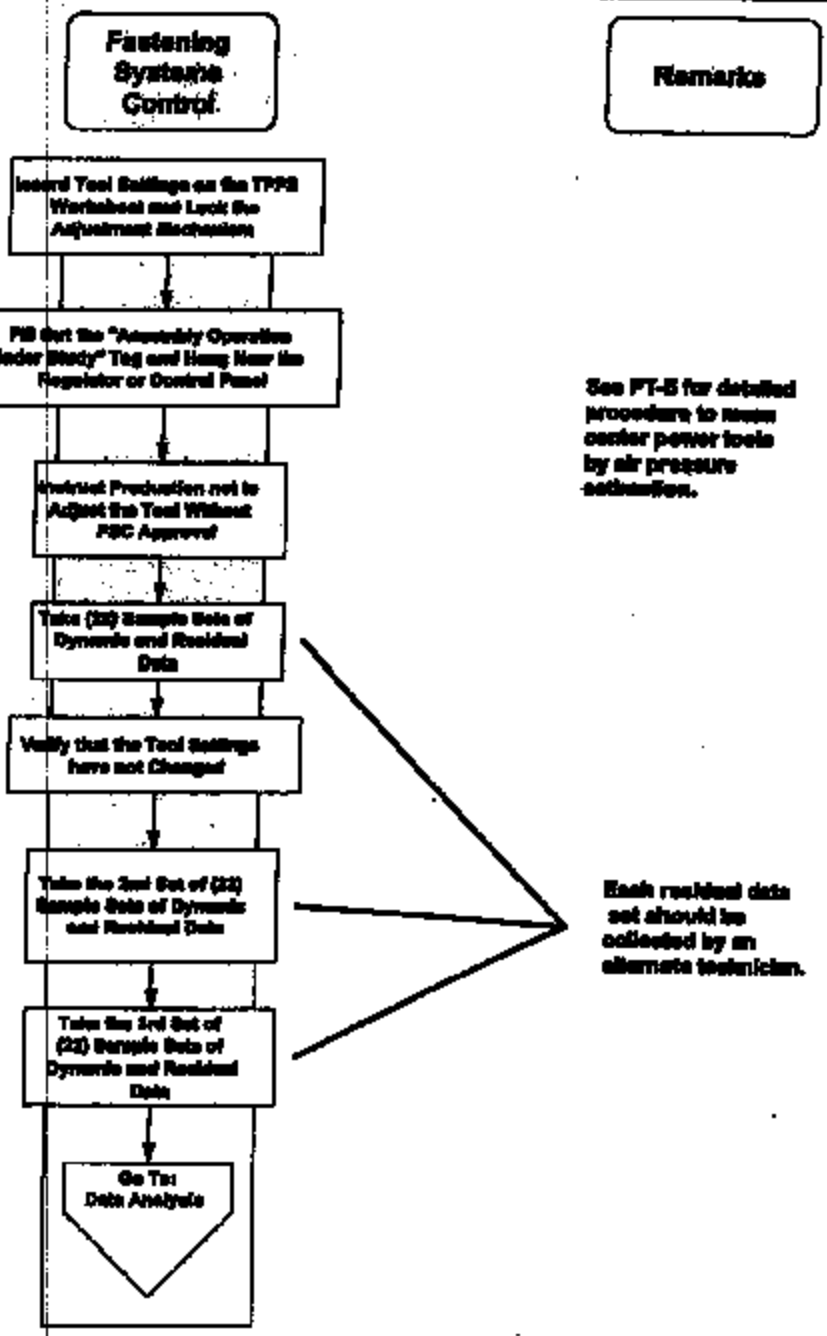
4. For pressure controlled tools, attach an air pressure gauge between the tool inlet and the supply hose and measure the air pressure reached at that torque (the pressure reached just before the tool stalls).

5. Set the air pressure at the operation using the method in step (4).

6. Install the tools tested in the tool crib on-line.

7. Perform the Torque Process Potential Study using the Residual Torque Study with Dynamic Mean Adjustment method.

TIAP - Torque Integrity Assurance Program
III, *D*, 3: Data Collection



10/30/98

D. Conducting a TPPS (continued)

3. Data Collection (see flow chart III. D. 3: dated 10/30/98)

a. Single Fastener Operations

1. Once the tool is properly adjusted, record the settings on the TPPS worksheet and lock the adjustment mechanism.

2. Fill out the "Assembly Operation Under Study" tag and hang it near the air regulator or control panel.

3. Instruct the operator and supervisor not to adjust the tool without FSC approval.

4. Sample 60 units for both dynamic (dynamic data only) and residual torque. The object is to get 60 useable samples of dynamic torque and 60 of residual torque. It is not acceptable to take 22 samples on two shifts and 16 on the third for a total of 60 useable samples. A minimum number of 20 samples must be taken per shift. The Datalityte must be in 'Peak' mode. Observe each securing cycle, record any discrepancies & Datalityte sample numbers, and flag the unit. Do not throw out any data without a cause identified.

A. Take a sample set of 22 units and analyze the sample.
For dynamic studies, both the dynamic and residual values should be taken from the same fastener.

Before taking the second and third sample sets, check that the process has not changed (i.e. tool, air pressure, etc. have not been changed). After taking the first 10 samples in each set, check that the mean is close to the original setting. For dynamic studies, use Datalityte "Hot" key for Pp and Ppk for the 10 samples.

B. Take another sample set of 22 units on the following shift.

C. Take the final sample set of 22 units on the next shift.

Note: Each residual data set should be collected by an alternate technician. It is statistically preferable to sample an operation on both day and night shifts. If it is not possible to do this, take samples on consecutive days or nights.

When conducting a MINI TPPS, it is only necessary to take 30 samples on a single shift.

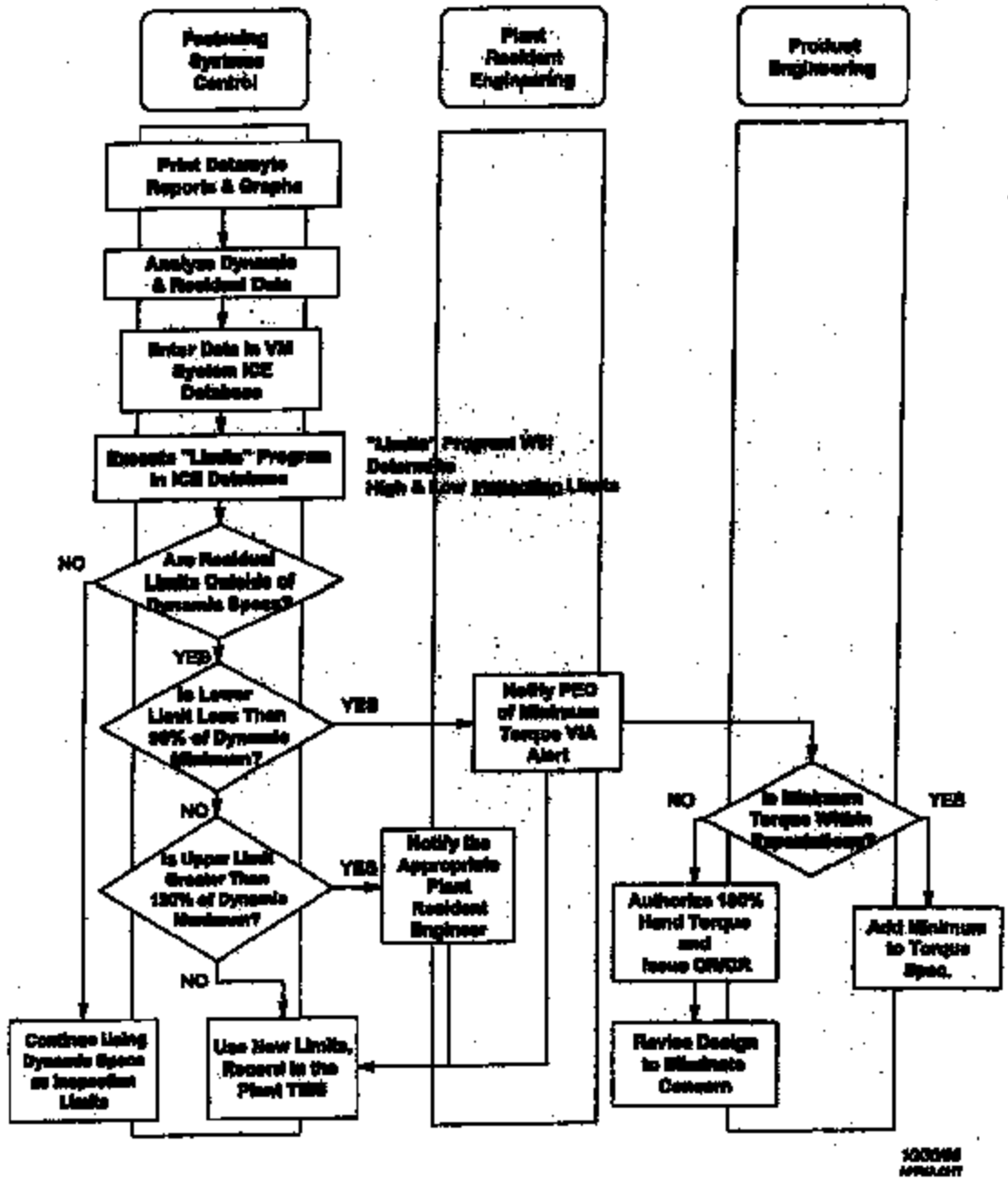
b. Multiple Fastener Operations

It is necessary to perform a full Torque Process Potential Study (TPPS) on each fastener for a multiple fastener operation *(using the "Single Fastener Operation" process listed in 3a above)*. Each fastener, along with a combined or "range" line, will be entered into the TPPS worksheet and VM system ICE (Information Center/Enhanced). The express routine "Limits" will automatically calculate the residual limits based on the "range" line information entered from the TPPS worksheet.

c. Multiple Station Operations and Left/Right Operations

It is necessary to perform a full Torque Process Potential Study (TPPS) on only one station for duplicate operations (including left/right). *On the remaining duplicate operations (including left/right), mean center the tool and determine the dynamic Ppk based on 30 samples (per spindle).* All duplicate operations must be set to the same dynamic mean and must be monitored by the same inspection limits.

TIAP - Torque Integrity Assurance Program III, *D*, 4: Data Analysis



D. Conducting a TPPS (continued)

4. Data Analysis (see flow chart III, *D*, 4: dated *10/30/96*)

a. Using the entire sample set, 60 to 88 samples, print out the following dynamic and residual DataMyte data analysis reports:

1. Individuals chart & moving range charts (X-bar & R chart).
2. Summary & histogram chart (Histogram).
3. Data report.

b. Analyze the dynamic data.

1. Is the data distribution on the histogram non-normal?

2. Is Pp or Ppk less than 1.33?

Note: The objective for operations with new components and tooling is a minimum Ppk of 1.67. For "critical" operations that have a Ppk less than 1.33, initiate 100% click wrench checking until the process is proven capable. If Ppk is less than Pp, centering the tool to the specification mean will improve this number.

If the answer to any of the above questions is yes, then the process may need improving prior to establishing residual torque limits. See chapter VI, Torque Surveillance, for sampling frequency. (Also, see PT-5, Chapter VI, How to Improve the Capability of a Process.)

If Ppk is less than Pp, centering the tool to the specification mean will improve this number.

Look for special causes for the above conditions (malfunctioning power tool or support equipment, part variability, slip-stick friction, etc) and correct them. If it is necessary to study the process more thoroughly, seek the help of SPC and TOPS trained personnel to set up a work plan. Correcting the concerns may require issuing a CR/CR. See Appendix A for CR/CR standard text. After correcting the concern, repeat the study.
If the data does not have a normal distribution, it must be transformed to determine control limits and to estimate Pp and Ppk. Seek help from the SPC Coordinator to perform this operation.

Note: For "Residual Torque Studies", there is only residual data to analyze the operation. Because it is impossible to determine whether the power tool is meeting the dynamic specification, assume the residual measurement reflects the dynamic torque.

c. Determine if the residual data is normal and stable by analyzing the histogram and individuals chart.

1. If the data does not have a normal distribution, it must be transformed to determine control limits. Seek help from the SPC Coordinator to perform this operation.

2. If the data is normal, proceed to step (d).

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4. Data Analysis (continued)

d. Complete the recap portion of the TPPS worksheet with data from the DataMyte report. For "Residual Torque Studies", enter 'N/A' in the dynamic mean space (MEAN DYN).

e. Enter the information from the TPPS worksheet into the VM system ICE (Information Center/Enhanced) application database (file name: xxTORQUE). Replace 'xx' by the 2 letter plant code of the specific plant (i.e. ATTORQUE is Atlanta).

A. "N/A" for residual studies

B. "$" symbol in front of the value to indicate that the dynamic values Pp and Ppk were derived from simulator data. For values greater than 100, truncate the decimal value to allow room to include the "$" in front of the dynamic mean value. The "$" must be in the correct column to allow for correct analysis of the data.

C. "#" symbol in place of a "$" (step (B)) to indicate that a "slave" tool was used. If dynamic data can not be taken with the production tool because it is fixtured, use a "slave" tool to determine the correlating residual mean. Adjustments to the production tool are made using the residual comparator of the slave tool.

f. Determine the Residual Limits.

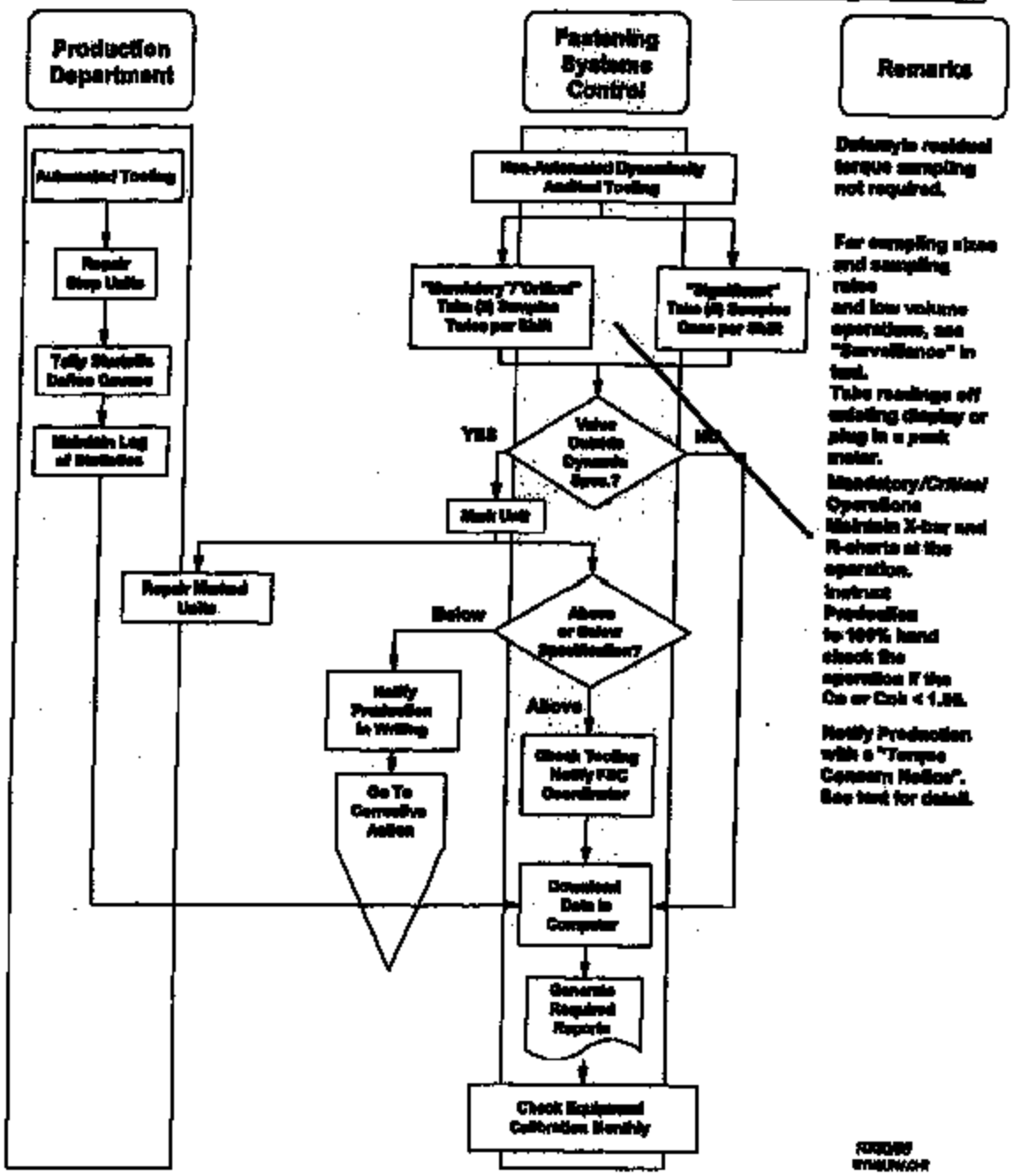
1. Run the express routine "Limits" to automatically calculate residual limits based on the information entered from the TPPS worksheet. "Limits" will identify operations where an Alert must be issued. Use the residual limits generated by the "Limits" express routine when writing a required Alert.

2. Enter the Alert number into the TPPS database as soon as it is written.

3. Enter the residual limits into the TISS for downloading to the torque audit route Datamyte(s).
(See Chapter VII, Torque Auditing Route Development, Section B, for entering operation descriptions).

4. Enter the Ppk value and study date into the TISS.

TIAP - Torque Integrity Assurance Program
IV, A: Dynamic Torque Surveillance



IV: Torque Surveillance

Torque Surveillance is the monitoring of threaded fastener operations to assure that they remain within specification and in control. This monitoring may give the first indication that the process is changing or that a concern exists. Monitoring involves taking torque data samples (dynamic or residual) and making contact with the operator. The data are analyzed for indications of process instability or failure to meet specification limits. Existence of these conditions will cause the taking of actions to stabilize the process and to prevent suspect units from getting out of the plant and to the customer. Operator comments also can give valuable information on the operation. Through performing the operation hundreds of times a day, an operator can detect subtle changes, such as noise level and reaction force. These could be indicators of tool or production part changes that need correction. Fastening Systems Control (FSC) and Production are responsible for implementing this procedure.

The surveillance frequency of an operation will vary depending on its designation, Mandatory/Critical or Significant, and its stability and capability. (See Chapter VI, Surveillance Frequency, for details).

See Chapter VII, Torque Auditing Route Development, for setting up auditing routes using the DataMyte.

A. Dynamic Torque Surveillance (see flow chart IV, A: dated 10/30/98)

Perform dynamic torque surveillance on all operations with internal transducers. The design and control logic of the power tool will determine how this surveillance is performed.

1. Automated Fastening Systems With Data Storage And Analysis Capability

This type of system will stop and sound an alarm when an out-of-specification condition occurs. The specification programmed into the tool controller is the dynamic mean and high and low limits set by the Product Engineering (PE).

FSC Responsibilities:

a. Add the operation to the Torque Inspection and Studies System (TISS), either manually or through the MPPS/GSPAS import procedure. Place an "A" in the "type" field to identify an Automated operation. Update the Cp, Cpk and first run capability fields in the TISS system at least once per month (no dynamic data will be collected in TISS).

b. Assure that the manufacturer has provided "certification" that the output spindle torque matches the controller display torque for the given calibration value.

c. Conduct a Torque Process Potential Study (TPPS) on each spindle to determine residual torque limits.

d. Verify, at least once a month, that the set values are correct and follow manufacturers instructions for corrections. Measure and record (5) residual torque values as part of the calibration check.

e. Verify, at least once a year, that the power tool's internal transducer measurements match the applied torque. Follow manufacturers instructions for corrections.

Production Responsibilities:

a. Maintain a log of occurrences of equipment shut-off and define the causes and corrective actions. If the operation becomes suspect, contact the FSC.

A. Dynamic Torque Surveillance (continued)

2. Other Transducerized Systems
There are two other types of fastening systems that have transducers. They are:

a. Automated Fastening Systems With Torque Data Indicator (No data storage or analysis)
This type of system displays the applied torque, but cannot store or analyze data.

b. Fastening Tools With Built-In Transducers
This type of system can measure the dynamic torque only by attaching a peak meter to the transducer. [An example of this type of tool is a wheel multiple used for lugnut secure. See VII Torque Auditing Route Development section D for more explanation on auditing wheel multiples.]

For dynamic torque surveillance purposes, treat these systems the same. Manually enter the dynamic torque data into a Datalityte or directly into the TISS database. Use the following procedure:

FSC Responsibilities:

a. Add the operation to the Torque Inspection and Studies System (TISS), either manually or through the MPPS/GSPAS Download process. Mark these operations as type "D" for Dynamic in the TISS database and add them to the appropriate torque route. Use TISS to program the route into the Datamyte, including the dynamic torque specifications.

b. If necessary, hook up a peak meter to the securing power tool.

c. Take five (5) peak torque readings from the equipment and manually enter the values into the Datalityte or write the values down for manual entry into the database. The Datalityte will sound a long beep if any value is out-of-specification.

d. Mark any out-of-specification units.

1. If any value is below specification, notify production with a Torque Concern Notice (see chapter VII, Torque Concern Notice). Go to the Corrective Actions, Chapter IV, Section C.

2. If two or more values are above specification,

A. Visually check the securing power tool and support facilities for discrepancies or changes (i.e. air pressure, oiler working, etc.). Ask if the operator noticed any changes.
B. Notify the FSC Coordinator to adjust or repair the tool.
C. Enter an "Assignable Cause" into the Datalityte.
D. Proceed with the route.

e. For Mandatory (M)/Critical (C) operations that are not stable or have a history of torque related concerns, calculate the average and range for the readings and plot them on a control chart at the operation. Use normal statistical process control (SPC) rules to trigger the following corrective actions:

If the Cpk is less than 1.00, instruct Production to begin click wrench checking all future units. (If Cpk is less than Cp, centering the tool to the specification mean will improve this number.)

If the X-bar chart indicates the operation is out of control (but not out-of-specification), then:

1. Form a team, with members from Production, Quality Control, Resident Engineering, FSC, and PVT.
2. Determine a root cause. (may or may not need TOPS).
3. When parts are the cause, Quality Control should CR the parts and get new parts on the line.
4. When it is a design problem, write a CR/CR.
5. When a temporary solution has been developed, issue an Alert/Deviation. 100% hand-retorque may be required until concern resolution.

2. Other Transducerized Systems (continued)

f. If all readings are within the specification range, proceed with the route.

1. Upon completion of the route, down load the data to the Torque Inspection and Studies System.
2. Generate the required reports.

g. If the process becomes suspect (i.e. the operator notices a change, torque display indicates bad torque), perform a residual torque check. Residual torque checks are not routinely required, but should be part of the calibration check.

h. Verify, at least once a month, that the cal values are correct and follow manufacturers instructions for corrections. Measure and record (5) residual torque values as part of the calibration check.

i. Verify, at least once a year, that the power tool's internal transducer measurements match the applied torque. Follow manufacturers instructions for corrections.

Production Responsibilities:

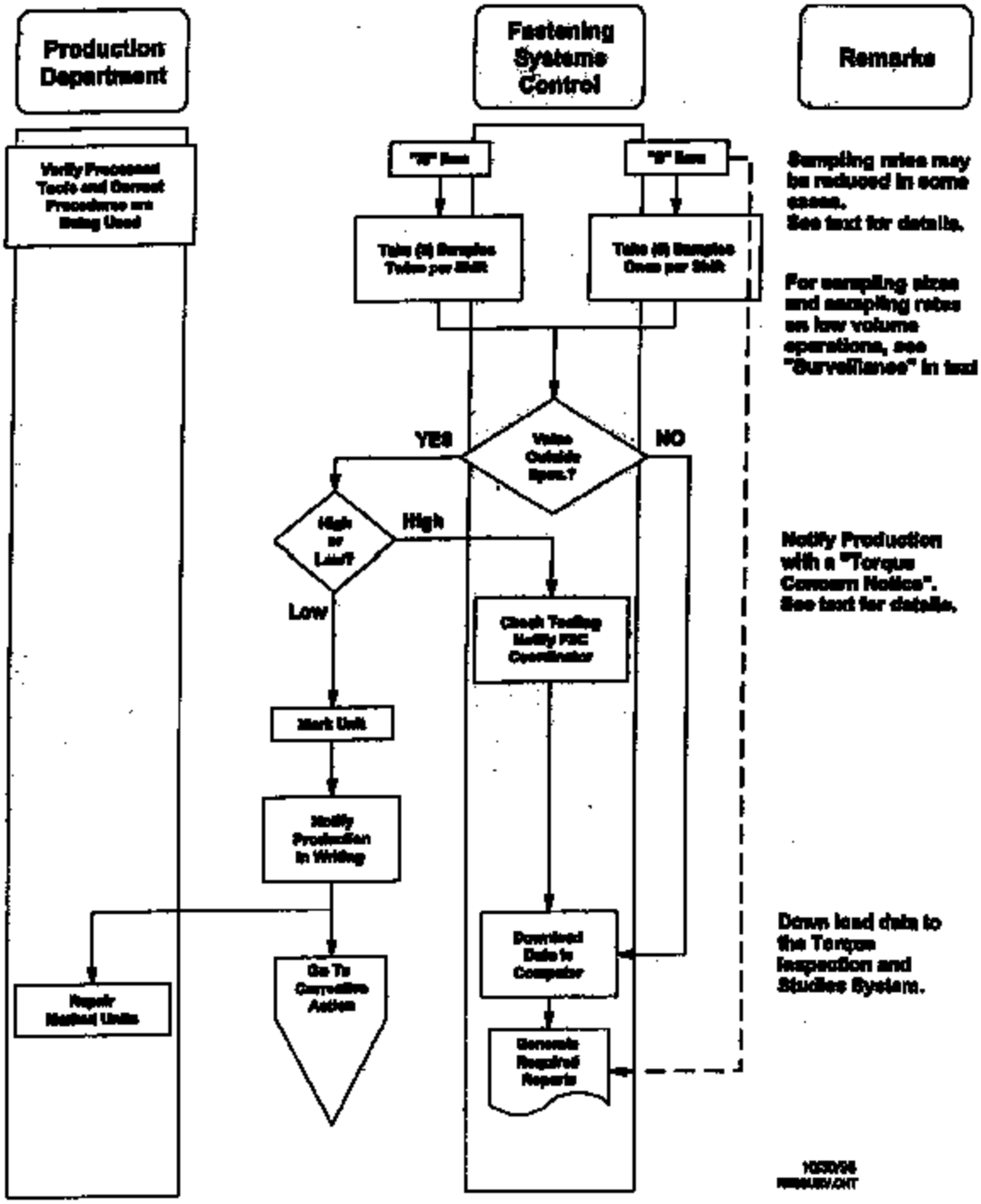
a. Production is responsible for using correct tooling and operating procedures on all operations.

b. Correct all units flagged by FSC personnel.

c. Notify the FSC if the process becomes suspect (i.e. operator notices a change, torque display indicates bad torque).

d. Review TISS reports. For Mandatory "M"/Critical "C" operations with Cpk less than 1.66, begin hand checking all future units with click wrench set to the minimum dynamic limit. Continue hand checking until notified by the FSC that corrective actions are in place.

TIAP - Torque Integrity Assurance Program IV, B: Residual Torque Surveillance



IV: Torque Surveillance (continued)

B. Residual Torque Surveillance (see flow chart IV, B: dated 10/30/99)

Residual Torque Surveillance is performed on all operations that do not have an internal transducer. Residual torque measurement will detect changes in the process but will not identify the cause (i.e. tool, component, operator, etc.). Process capability cannot be determined from residual data. A dynamic Torque Process Potential Study must be performed to determine a preliminary capability (see chapter IV, Torque Process Potential Studies).

FSC Responsibilities:

1. Enter the operation into the TISS database.

   a. Enter the operation into TISS manually or by using the MPPS/GSPAS import process. Make sure that all the relevant fields are filled out. If residual inspection limits are not used, the "residual" fields should be left blank. Use the following identifiers for the "type" field:

      " " A TPPS has not been completed, dynamic specifications are used as inspection limits.
      "S" A TPPS has been completed, dynamic specifications are used as inspection limits.
      "R" A TPPS has been completed, residual limits are used as inspection limits.

      If a TPPS study has been completed, fill out the "TPPS Date" and "Ppk" fields in the TISS record.

   b. Set the DataMyte to measure peak torque (not break away or other algorithm).

2. Measure five (5) units with the DataMyte. When taking a measurement, watch the fastener for movement. When movement begins, stop applying torque to it. The DataMyte will sound.

3. Mark any units that are outside the inspection limits or show any other concern (missing fastener, loose joint, crossed or stripped thread). Write the ROTATION number on the Torque Concern Notice.

   a. If any one torque value is below the lower inspection limit, notify Production with a Torque Concern Notice (Chapter VII, Torque Concern Notice). Go to Corrective Actions, Chapter IV, Section C.

   b. If two or more values are above the upper inspection limit:

      1. Visually check the tool and support facilities for discrepancies or changes (i.e. air pressure, oiler working, etc.). Ask the operator if any changes were noticed.
      2. Notify Production and the FSC Coordinator with a Torque Concern Notice. The FSC will assess the situation and make a determination as to further actions required (i.e. tool adjustments, dynamic torque check).
      3. If the FSC determines that units were produced with dynamic torque above the upper spec limit, the FSC will notify Resident Engineering, to determine what, if any, corrective actions are required.
      4. Proceed with the route.

   c. If a unit shows another fastener concern (missing or loose fastener, crossed threading or stripped threads, loose joint),

      1. Notify production immediately with a Torque Concern Notice so the unit can be repaired.
      2. Select and enter an "Assignable Cause" into the DataMyte.

B. Residual Torque Surveillance

3. a. (continued)

3. Notify the FSC if a concern becomes chronic. The Coordinator will assess the situation and take the required steps (i.e. form a team, initiate problem solving, write CR/CR, etc.) to eliminate the concern.

4. If all readings are within the residual limit, proceed with the route.

5. Upon completion of the route, down load the data to the Torque Inspection and Studies System.

6. Generate the required reports (see chapter VIII, Torque Inspection and Studies System).

Production Responsibilities:

1. Production is responsible for using correct tooling and operating procedures on all operations.

2. Correct all units flagged by FSC personnel.

3. Notify the FSC if a process becomes suspect (i.e. operator notices a change, fastener is not being driven all the way in, fastener breaks with full rundown).

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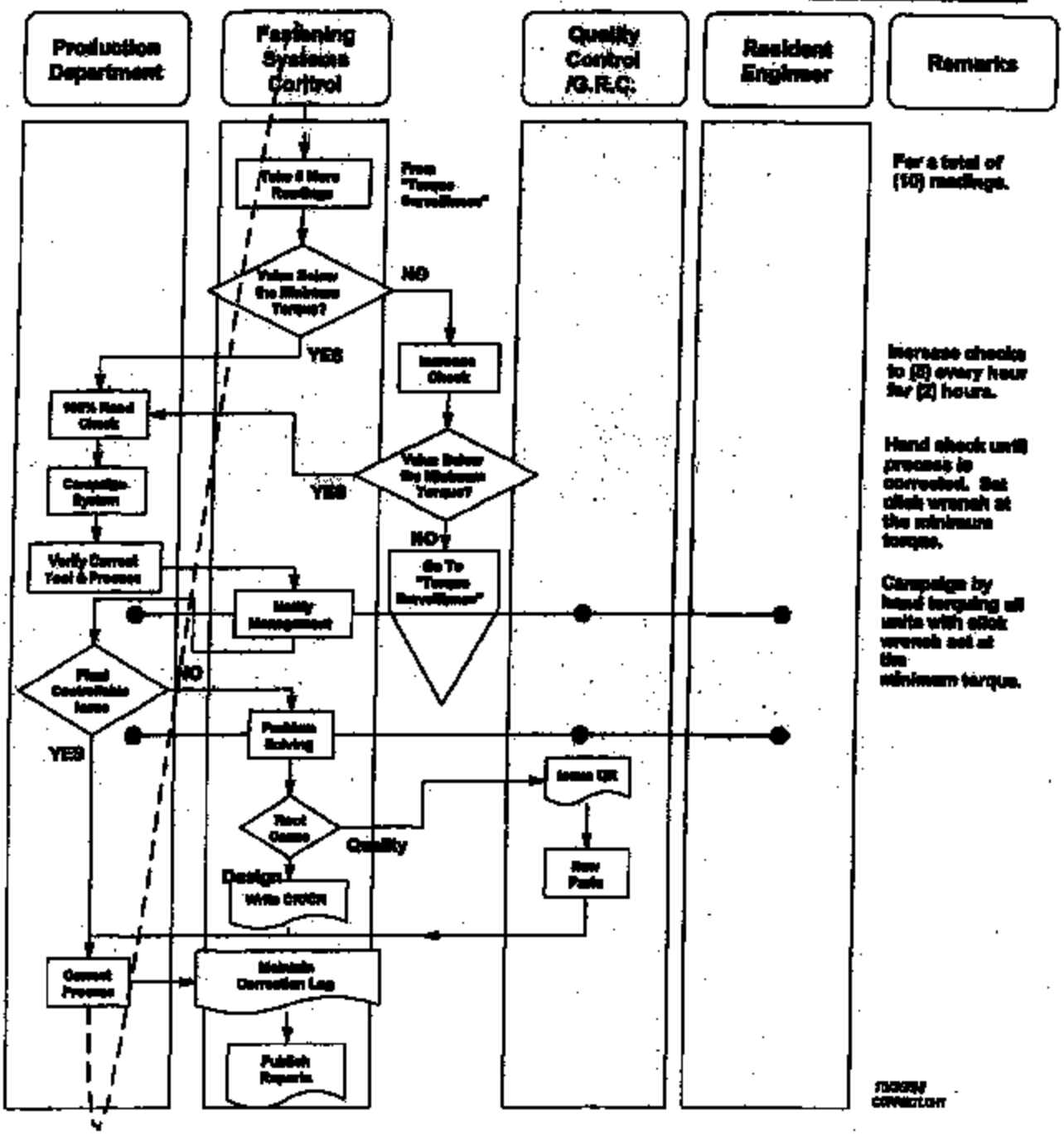
TIAP - Torque Integrity Assurance Program
IV, C: Corrective Actions



IV: Torque Surveillance (continued)

C. Corrective Actions (see flow chart IV. C: dated 10/30/98)

Use this procedure whenever an operation is below the minimum torque.

FSC Responsibilities:

1. Take five (5) more torque samples (dynamic or residual) on the operation.

   a. If all the samples are within the dynamic specification (dynamic data) or the residual limits (residual data), take five (5) torque samples every hour for the next two (2) hours. If no other out-of-specification samples occur, return to normal sampling (see sections A or B of this chapter, Dynamic Torque Surveillance, or, Residual Torque Surveillance, respectively).

   b. If one (1) or more of these samples is below the minimum torque:

      1. Instruct production to begin hand checking all future units with a click wrench set at the minimum torque.

      2. Assist production to determine if the concern is plant controllable (tool, socket, operator, air supply, tool setting, lubricator). If the tool setting is suspect, measure the dynamic torque using an external transducer.

      3. Repeat steps (1) and (1a) after production has corrected the operation.

      4. If no immediate action corrects the concern or if no root cause is found, notify management.

         A. Form a team with members from Production, Quality Control, Resident Engineering, FSC, and PVT.
         B. Determine a root cause (may or may not require TOPS).
         C. When parts are the root cause, Quality Control will QR the parts and remove bad stock from the line.
         D. When the root cause is a design issue, write a CR/CR.
         E. When a temporary solution has been developed, issue an Alert/Deviation. 100% hand checking may be required until concern resolution.

      5. Repeat steps (1) and (1a) after production has corrected the operation.

      6. Enter the process adjustment date into TISS if the corrective action resulted in an adjustment or correction to the tool and/or socket.

      7. If the process is identified as "reduced inspection frequency" (see Chapter VI, Surveillance Frequency), reset the "Class" field to its original frequency.

      8. File the completed "Torque Concern Notice" with the records for that operation.

6. Corrective Actions (continued)

Production Responsibilities:

1. When informed by FSC, begin hand checking all future production with a click wrench set to the minimum torque. Continue hand checking until the FSC determines that the process is back in control
2. Correct all plant controllable causes immediately.
3. Campaign downstream units with a clicker wrench set at the minimum torque.
   a. Mandatory (M) / Critical (C) Operations
      1. Check downstream units:
         A. to the last sampled unit (4 hours earlier) or
         B. until all units that have not been shipped are checked.
      2. If suspect vehicles have been shipped, refer to Procedure VOPQUG004, Product Containment and Preventive Actions. It is not necessary to invoke Procedure VOPQUG004 if the dynamic torque checks reveal the tooling is operating within the dynamic torque specification.
   b. Significant Characteristic (SC) or Warranty (WC) Operations
      1. Check downstream units:
         A. to the last sampled unit or
         B. until (30) units in a row are found with the proper torque (i.e. no fastener rotation) or
         C. to the point in production where checking becomes impossible without major disassembly of the vehicle.
      2. The FSC Leader should consult with the Resident Engineer to determine if any additional action is required.
4. Assist FSC personnel in their responsibilities.
5. Normal operations may resume when FSC testing determines that the operation is within the dynamic specification.
6. Complete the Corrective Actions section of the Torque Concern Notice and give a copy to FSC.

V:Torque Concern Notice

The Torque Concern Notice is a written notice to the Line Supervisor identifying an operation that is outside the dynamic specification or the residual limits. A pad of notices should be carried by each inspector. This form has three copies, two are given to the Line Supervisor, the other is retained by the inspector. This copy can be discarded when the top copy is returned by the Line Supervisor.

The inspector will complete the form through box "ROT # LAST OK" (rotation # of last OK unit from prior inspection records in the Datamyte) and sign the form. The inspector also enters the Torque Concern Notice Number into the DateMyte in the space provided. The Line Supervisor will sign the form and take the top two copies. The Supervisor is required to complete the "ACTION TAKEN" and request a re-audit of the operation to verify the effectiveness of the corrective action. The inspector will record the re-audit values in "ACTION TAKEN" and indicate the rotation number of last re-audited unit in the "ROT # ALL OK" box.

The top copy will be taken by the inspector and will be filed with the TPPS records of that operation. The second copy will can be retained by the Line Supervisor for future follow-up, or discarded. The signatures of the PSC Coordinator and Area Manager are optional.

A locally designed torque concern notice may be used in place of the Torque Concern Notice form BBA 9172, (dated 7/15/91), shown below. The local form must contain, at least, the information shown below. The form must be sequentially numbered for tracking purposes.

TORQUE CONCERN NOTICE

NO._____

CARLINE:	SHIFT:	ZONE:	DATE:
PROCESS SHEET #:		MANUAL/AUTO/OTHER	STSC:
PROCESS DESCRIPTION:			
TORQUE PROBLEM:	NEUTRAL/DYNAMIC	HIGH/LOW	DEPTH:
ACTUAL READINGS:			
ROT # 1ST DEFECT:	ROT # LAST OK:		ROT # ALL OK:
ACTION TAKEN:			
TORQUE REP:		SUPERVISOR:	
PSC COORD:		AREA MGR:	

BBA 9172 (ISSUED 7/15/91)

VII. Surveillance Frequency

The surveillance frequency of an operation will vary depending on its designation and state. Product Engineering designates operations requiring auditing. These operations have a designation in the CTL column of the Tool Screen (PF12) in GSPASAMPPS, an "M" designates a mandatory compliance operation, an "S" or "W" designates a significant characteristic or warranty operation. These designations will be in the "Class" field of TISS. The plant may designate other operations to be monitored with an "O" in the "Class" field. The plant may stop auditing plant designated operations at any time.

Designated operations must be audited at the following frequencies:

A. Mandatory (M)/ Critical (C) Operations

The sampling rate on Mandatory/Critical operations will begin at 5 fasteners twice per shift, separated by at least four (4) hours. After a TPPS and after the process is determined stable, the sampling rate may change, as follows:

For operations that have shown process stability for at least one (1) month and have a Ppk greater than or equal to 1.67, determined by a TPPS, or a Cpk greater than or equal to 1.33, determined from dynamic torque surveillance, the sampling rate may be reduced to 5 fasteners per shift. This condition is valid for any data process only if a compelgnable item can be contained within the plant at the reduced audit frequency.

On such operations, the words "Reduced Inspection Frequency" or "RIF" should be entered in the "Comment" field in the TISS database to document the change. The "Class" field should be changed from M (Mandatory) to G (Gfitendatory, or "Mandatory, Good capability). The database should already contain the TPPS Data and the Ppk or Cpk for the process, as well as the Last Process Adjust Date. The routes that include the process can then be changed to include only one inspection per shift (instead of two) for this process.

> Note: If any low torque is found on a "reduced inspection frequency" operation, it must be returned to full inspection frequency. After the process has been stable for one month, the reduced inspection frequency may be reinstated.

B. Significant Characteristic (S) or Warranty (W) Operations

The sampling rate on Significant or Warranty operations will begin at 5 fasteners every shift. This rate may be reduced after a TPPS and after the process is determined stable.

For operations that have shown process stability for at least one (1) month and have a Ppk greater than or equal to 1.67, determined by a TPPS, or a Cpk greater than or equal to 1.33, determined from dynamic torque surveillance, the sampling rate may be reduced to 5 fasteners per day, alternately sampling each shift.

On such operations, the words "Reduced Inspection Frequency" or "RIF" should be entered in the "Comment" field in the TISS database to document the change. The "Class" field should be changed from "S" or "W" to "R" (Reduced). The database should already contain the TPPS Data and the Ppk or Cpk for the process, as well as the Last Process Adjust Date. The routes can then be re-arranged so that the process is sampled alternately on day and night shifts.

VI. Surveillance Frequency

C. Low Volume Process Operations

Some operations are used infrequently. This makes it difficult to maintain a consistent sampling rate. Low volume operations are defined as seven (7) or fewer jobs per hour and less than five (5) of the subject fasteners per unit. Create a separate route (matrix) for all low volume operations. Keep low volume readings in the DataMyte until a full sample of five (5) readings is obtained. This is necessary because the database load program will mark as "missed inspections" any sample set containing fewer than five readings. If additional samples are required, record them in a secondary matrix. Create the new matrix using either the set-up or re-audit mode of the DataMyte. These additional readings will not appear in the computer generated reports. For these operations, use the following rule.

1. Mandatory (M)/Critical (C) Compliance Operations - Sample one unit every four (4) hours.
2. Significant Characteristic (S) or Warranty (W) Operations - one unit every shift.

VII: Torque Auditing Route Development

Torque auditing routes allow the efficient sampling of threaded fastener operations. The operations included in a route are based on zone location and audit frequency. This chapter covers details of route development for special situations.

Torque auditing is normally done with a DataMyte Model 3053. For information on these, see DataMyte's user guide or the B&A DataMyte Training Manuals. For more information on torque inspection, refer to the Vehicle Operations (VO) Torque Inspection and Studies System (TISS) User's Guide.

A. Calibration

Torque measuring equipment is to be calibrated in accordance with FAP03-015, Control, Calibration, and Maintenance of Test Equipment. Verify DataMytes and Transducer Torque wrenches at least once a month or when abnormal readings are observed.

Set click wrenches that are used in 100% daily production to the mean of the dynamic specification. Check at least once per week that they maintain that torque level, if the operation is NOT under torque surveillance. Otherwise, check at least once per month.

Set click wrenches that are used in repair operations to the mean of the dynamic torque specification. Check at least once per month that they maintain that torque level.

Set click wrenches that are used in campaigns and hand checking operations (i.e. Corrective Actions) to the minimum torque. Check at least once per month that they maintain that torque level.

All other click and measuring equipment must be verified at least once per month. Suspect wrenches or wrenches that have been dropped must be verified immediately. Maintain a log of verification checks by serial number for each click wrench, measuring wrench, and DataMyte *using a suitable record system.*

The calibration setting of electric or electronically controlled power tools should be checked at least once per month and five (5) residual torque values recorded. Verify at least once a year, that the power tool's internal transducer measurements match the applied torque from an external "calibration" transducer.

B. Element Numbers, Types & Description

Data is identified by process number in the TISS. This number is the MPPS/GSPAS process number with the element number appended to it. For example, process CX1250 element 100 is listed as CX1250100.

1. Identify identical left and right side operations with the true element number and the element number incremented by one, respectively. See section G, Process Consolidation, of this chapter, for a full explanation.

2. Place an "A" in the "Type" field when the operation is automated (no daily data is collected).

VII: Torque Auditing Route Development

B. Element Numbers, Types & Description (continued)

3. Place a "D" in the "Type" field when dynamic torque data is collected on the operation.
4. Place an "R" in the "Type" field when the audit specification is a residual limit based on a TPPS, not the dynamic specification.
5. Place an "E" in the "Type" field when an off-set adapter is used to collect residual data on the operation.
6. Place an "S" in the "Type" field when a TPPS has been successfully completed on the operation and the residual inspection limits are the dynamic torque specification limits.
7. Leave the "Type" field blank if a TPPS study has not yet been completed for the operation (except for "A" and "D" Types).

C. Off-sets

The addition of an off-set adapter to an electronic torque wrench will affect the torque value it measures. Any off-set adapter that changes the effective length (lever arm) of the torque wrench changes the value received. Hand position will affect this relationship, also. So, be consistent with hand position and both length and position of the off-set adapter used on an operation.

Create a new gauge in the DataMyte gauge table with a Full Scale Value that is corrected to allow for the off-set. The correct value can be determined using the Power Tool Analyzer. Enter this gage number into the TISS records for the process, and the TISS gage table. The DataMyte will handle the correction, there is no need to adjust the residual limits for the off-set. Enter "E" into the "Type" field and a note like "offset" into the "Comment" field in TISS.

D. Multiple Spindle Operations

Torque data on all multiple spindle power tools may be taken residually. The residual torque for each spindle is to be measured as an individual system. Record and identify the data of each spindle separately. The daily torque inspection sampling is stated under section VI Surveillance Frequency.

The exception to residual torque readings is wheel multiples (Lugnut secure). Torque data from wheel multiples equipped with transducers is to be taken dynamically using a peak meter or a torque monitor. The dynamic torque for each spindle is to be measured as an individual system. Record and identify the data of each spindle separately. Sampling will be (5) readings per spindle, once per shift. *In addition to assure that the monitor and transducers are reading correctly, a sample of (1) residual reading of each spindle every (4) hours per shift must be performed.*

E. Part Usage

If incorrect part usage is observed, notify the Zone Supervisor and FSC Coordinator. Production is responsible for using the processed parts and for identifying and correcting all vehicles with suspect parts.

Enter "WRONG FASTENER" into the "Assignable Cause" field in the DataMyte regardless of whether the readings are in or out of spec.

VII: Torque Auditing Route Development (continued)

F. Process Consolidation

Processes may be combined and treated as one operation, regardless of model and vehicle line, when the following conditions are met:

1. Same power tool
2. Same operator
3. Same torque specification

When processes are consolidated, enter the process number that they have been combined with in the "Comment" field of the TISS database (i.e. "See #000000" to document this action). Make sure that ONLY the operation where the data is collected is in an inspection route, and the others (without any data) are just listed in the TISS database for reference.

If a process is done on both sides of the vehicle or in multiple stations, create separate element numbers in the DataMyte, making separate inspections for each side and station.

For symmetrical operations, assign the left side operation the true element number and the right side operation the true element number plus 1 (i.e. if the element number is 30, assign the left side data 30 and the right 31).

For multi-station operations, assign incremental element numbers to each station. Clearly mark each station so future data can be compiled in the correct database.

G. Repair Operations

Torque control in off-line and on-line repair areas is to include the following:

1. A list of torque specifications for all operations repaired in that area.
2. Power tools capable of achieving the specified torque, or
3. Click or dial indicator wrenches to assure the correct torque on repair operations.

Set click and dial indicator wrenches that are used in repair operations to the mean of the dynamic specification. Check at least once per month that they maintain that torque level.

Suspect wrenches or wrenches that were dropped must be calibrated immediately. Maintain a log of calibration checks by serial number for each click wrench, measuring wrench, and DataMyte.

H. Rotation Number

Use rotation numbers to establish points in the production sequence at which corrective actions began or ended. After taking torque readings, enter the rotation number into the DataMyte using the label feature. Use the rotation of the last unit in the sample set. Rotation numbers are included in some of the computer generated reports, with the actual torque values. Details of the "label feature" are in the DataMyte User's Manual.

VIII: Torque Inspection and Studies System

The Torque Inspection and Studies System (TISS) is a PC database program for recording, analyzing, and reporting torque process information in an assembly plant. Process information is entered into TISS manually or through the automated Import MPPS/GSPAS Data process. Inspection routes are defined and maintained in TISS, and downloaded into the DataMytes. Data collected in the DataMytes is uploaded into TISS for analysis and report generation.

A. Major TISS Reports

The following are the major TISS reports. Most reports include options to customize the reports to fit the various needs of the plants.

1. Daily Report - This report summarizes the number of operations to be checked, the number checked, and lists all operations that had at least one data point outside the inspection limits. Optionally, it can break the information down by shift for each department (Body, Paint, Trim, Chassis), or by supervisor. This report goes to the area manager, and to the zone supervisor.

2. Periodic Summary Report - This is similar to Report 1 except it includes as many days of production as desired.

3. Process History - This report provides a process history of a single operation. It can include any number of days.

4. Process Ranking Summary - This report is a ranking of all operations by percentage of samples out-of-specification. It has options to include only out-of-spec processes, or all processes. The Process Ranking Summary provides the following information:

   - Rank #
   - Operation/Element Number
   - Process Description
   - Number of Data Points in Report
   - % Under Specification
   - % Over Specification
   - Total % Out-of-Specification
   - Inspection Limits - Low and High
   - Actual Torque Reading - Lowest and Highest

   The Process Ranking Summary is presented at the appropriate Plant Management meeting, with plant action on significant out-of-specification conditions.

5. Quality Operating System (QOS) - This report lists the processes that have been outside the inspection limits for the current and preceding months. This report is presented at the appropriate Plant Management meeting.

6. Process Listing - This report provides a list of processes, with all the information about the processes, except for actual torque readings.

7. Route List - This simply lists which processes are on a route, in order.

8. Export Process History - This option will export process history of a single operation to an ASCII text file which can be used by Excel, Lotus 123, or other software. This allows flexibility in graphing and analysis of historical data. It can include any number of days.

VIII: Torque Inspection and Studies System (continued)

TISS provides a number of options for route and file maintenance, data communication, and so on. For more information, see the Torque Inspection and Studies System Users Guide. A few important procedures are highlighted here:

B. Related Procedures

1. Import MPPS/GSPAS Data - This procedure can be used to automatically copy all MPPS/GSPAS torque operations, specifications, and tool data into TISS. This simplifies creating the TISS database for a new vehicle line. The procedure can also be used to check MPPS/GSPAS for any changes, and update an existing TISS database. A report can be generated showing all the differences between TISS and MPPS/GSPAS data. The FSC may run this process regularly to ensure that the TISS database is up to date.

IX: Record Retention

The following records are to be identified on the Documents/Records Matrix of the responsible department/activity and retained in accordance with the Global Information Standard 1 (GIS1), OR the Corporate Management Records (CRM) Retention Schedule, the European Records Management Manual (ERMM), or other Regional Records Management System may be used until March 31, 1999.

A. Torque Process Potential Studies (Hard Copies and Summaries)
Retain the latest Torque Process Potential Study (full and mini) for each fastener operation for One (1) year after the termination of the operation.

28.04 (GIS1), Last Use + 1 year
28.04 (CRM), Active +1 year

B. Inspection Data & Torque Concern Notices
Retain all data for One (1) year after the conclusion of the current model year.

28.04 (GIS1), Last Use + 1 year
28.04 (CRM), Active +1 year

C. Calibration/Verification Data (Datalinks, Transducers, Clicker Wrenches, etc.)
Retain all data for Two (2) years after the date the original calibration/verification record was superseded by the new calibration/verification record .

28.05 (GIS1), Superseded + 2 years
28.05 (CRM), Active +2 years

X: Forms

XI: Exhibits:

Flow Charts:

XII: Related Procedures and Documents

Refer to the Vehicle Fastening Systems Master Document List for the latest revision level of the documents.

1. Ford Portable Power Tool Manual Standards:

   PT-1, Standard Tool Category (Size) Numbers for Threaded Fastener Tools

   PT-2, Ford Power Tool Certification Program

   PT-3, B&A Standard Torque Specifications

   PT-4, Standard Drive Sizes for Certified Tools

   PT-5, Guidelines For Obtaining Threaded Fastener Capability

   PT-6, Guide for Socket Clearance Requirements

   PT-7, Ergonomic Considerations for the Selection and Specifications of Power Tools

   PT-8, Handling and Control of Power Tools in Assembly Plants.

2. DataMyte Model 3053 User Guide
3. DataMyte Model 3053 Training Manuals
4. VOGO Torque Inspection and Studies Systems User Guide
5. Ford Continuing Process Control and Process Improvement guide book, #80-01-251
6. Vehicle Operations SPC Manual:

   SPC-101-D, Process Potential Study

   SPC-304-C, Monitor Mode - Considerations for Reducing Sampling on Significant Characteristics Having Required Mandatory/Critical Checks

   SPC-602-D, Normality Check

7. *FAP09-016, Control Calibration and Maintenance of Measurement and Test Equipment.*
8. *VOPQUG-004, Product Containment and Preventive Actions.*
9. Failure Mode & Effects Analysis (FMEA) Handbook
10. *Deleted*
11. Videotapes:

    Torque: A Measure of Quality

    Team FSC: Roles and Goals of the Fastening Systems Control Team (Part 1 & 2)

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Appendix A contains:

- Torque Control Plan Letter to Product Engineering & Signature Page, August 1994
- Flow Chart III, *D*, 4; Data Analysis: dated *10/30/98*
- TPPS CR/CR and Alert Resolution Flow Chart: dated *10/30/98*
- TPPS CR/CR & Alert Resolution
- TPPS FORM #1 - Inspection Alert Notification, 1/94
- CR/CR FORM #2 - Request New Torque Specification, 1/94
- CR/CR FORM #3 - Request Expanded Torque Specification, 1/94
- CR/CR FORM #4 - Request Design Change, 1/94

August 1994

To: All Product Design Engineers - All PEOs

Subject: Torque Process Control Plan

Reference: B&AO Operating Procedure III-A-41 (revised)

The referent procedure identifies three different torque values:

- Dynamic Torque: the installation torque value, which represents the torque specified by Design Engineering.
- Residual (or Inspection) Torque: the value that an inspector measures when he monitors the results of Dynamic Torque applied to a fastener.
- Minimum (Static) Torque: the lowest allowable torque value.

The Torque Process Potential Studies (TPPS) described in the referent procedure clearly indicate that there often is not a precise correlation between these torque values. Accordingly, the respective PEOs must recognize the possible differences between Dynamic Torque, which is the basis for the B&A process to install a fastener to spec, and the Residual Torque, which is seen when a secured joint is inspected (e.g., with a torque wrench).

Operating Procedure III-A-41 and related documentation, which lists the Inspection Limits for each operation, are to be ***recognized as the Torque Process Control Plan.***

This signed letter constitutes approval of this Control Plan by the respective PEOs. Additionally, ***it provides "blanket" approval for the use of "Inspection Limits"*** according to the criteria described below.

- *Prior to completion of a TPPS:*
  Use dynamic specifications as the Residual (Inspection) Limits.

- *After completion of a TPPS and process capability (Ppk > 1.33) has been established,* the Residual (Inspection) Limits will be as follows:

  A - If the residual limits fall within dynamic specifications, then continue to use the dynamic specifications as the Inspection Limits.

  B - If the lower residual limit falls below the minimum dynamic specification but is greater than (or equal to) 80% of the minimum dynamic specification, then use the TPPS residual limits as the new Inspection limits. No PEO notification is required for this condition.

  C - If the lower residual limit is less than 80% of the dynamic minimum, then notify the PEO of the minimum (static) torque (VIA a WERS Alert). B&A will use the residual values determined by the TPPS as the Inspection Limits. The PEO will either:
  - Notify B&A that the minimum torque is acceptable by adding the Minimum (Static) Value to the engineering specification. (The Control Plan will be updated accordingly.) or
  - Issue a WERS Concern to initiate a design revision and authorize B&A to 100% hand torque with a click wrench set to the dynamic minimum until the design revision is in place.

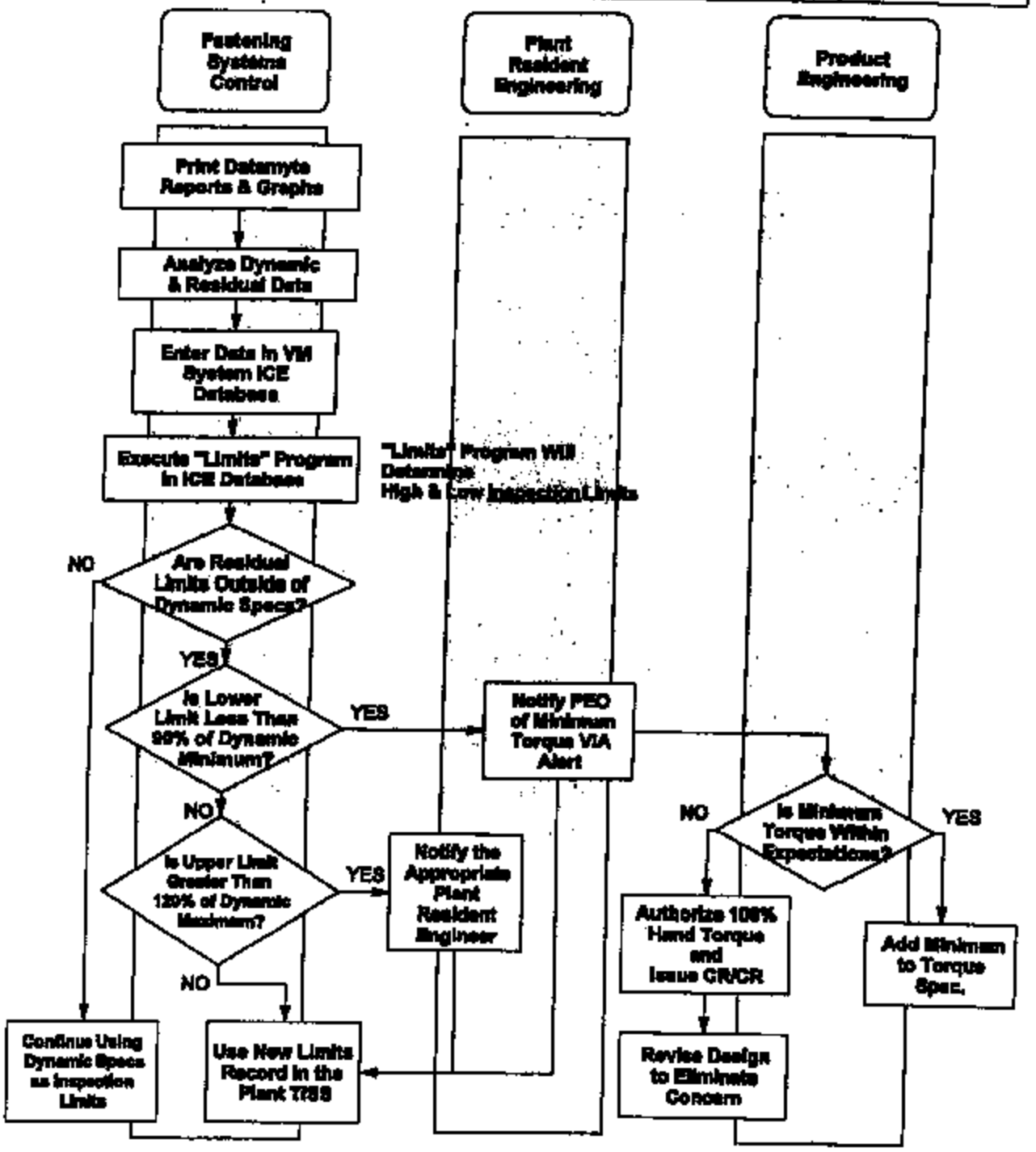
  D - If the upper residual limit is more than 20% above the maximum dynamic specification, B&A will notify the appropriate plant resident engineer and use the TPPS residual limits as the Inspection Limits.

A description of this process is shown on the attached flow chart. The signature page is on the reverse side.

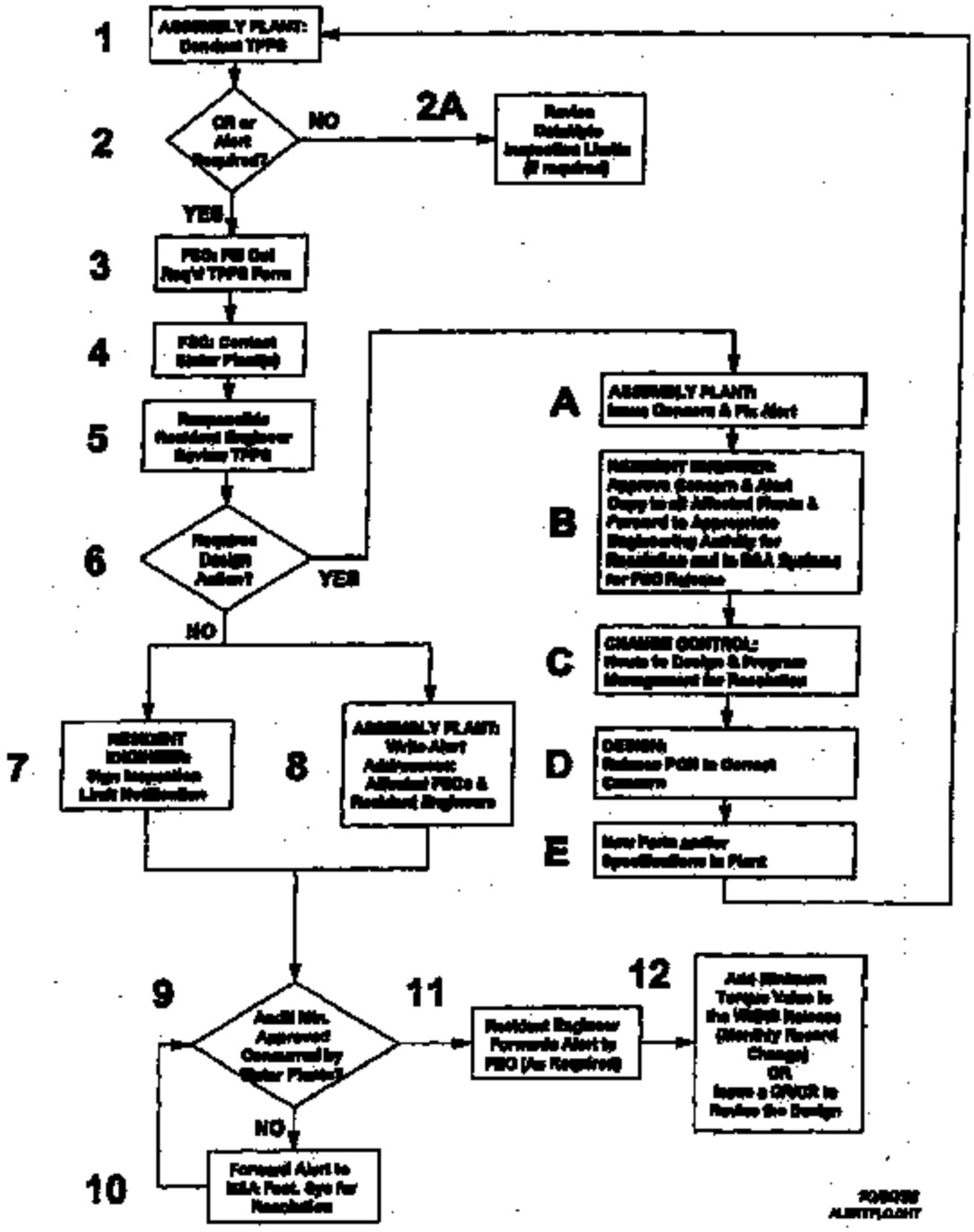
Torque Integrity Assurance Program (TIAP)
Torque Process Control Plan Sign-off

Organization	Signature	Signature	Signature
Body Engineering	J. A. Burton Chief Engineer	B. E. [illegible] Truck Chief Engineer	A. Mcdonell Body Technology Chief Engineer
	D. H. Smith Executive Engineer Reliability Technology		
PTO Engineering	T. Howard Engine Chief Engineer		
Chassis Engineering	A. R. Kammerer Chief Engineer		
Light Truck Engineering	R. H. Boysen LTE Director	E. Bayley Chassis Chief Engineer	F. N. Ferrill Powertrain Chief Engineer
CONCUR			
Body and Assembly	J.P. Barnard BAAE Manager	B. P. Cambern Chief Engineer Trim, Chassis, Electrical & Emissions	J. E. Hilligoss Chief Engineer Stamping and Structures
	J. L. Adams Executive Engineer Chassis Assembly		
ASEO	R. H. Munson Executive Director		

TIAP - Torque Integrity Assurance Program III, *D*, 4: Data Analysis



TIAP - Torque Integrity Assurance Program
TPPS CR/CR & Alert Resolution Flow Chart



TPPS CR/CR & Alert Resolution (see flow chart)

The following is a description of the resolution flow for Torque Process Potential Study CR/CRs and Alerts. Each item number corresponds to a box on the attached flow chart.

1. Assembly Plant Conduct TPPS - The Assembly Plant Fastening Systems Control Group (FSC) should conduct a Torque Process Potential Study, as described in Operating Procedure VOPFAG241.

2. CR or Alert Required? - Based on the study results, the VMICE Database "Limits" program will determine if a CR or Alert is required. In general, a CR/CR is required when a process can not be done to the Engineering Specifications. An Alert is required if the Lower Residual Limit is less than 80% of the Dynamic Torque Lower Specification Limit, or if the Upper Residual Inspection Limit is greater than 20% above the Dynamic Torque Upper Specification Limit.

2A. Revise DataMyte Inspection Limits if Required.

3. FSC Fill Out Required TPPS Form - When it is determined that a CR or Alert is required, the FSC must fill out the appropriate TPPS summary form (TPPSFRM1, 2, 3, 4). Each form covers a specific type of torque concern, as follows:
   TPPSFRM1, Inspection Limit Notification
   TPPSFRM2, CR/CR DATA FORM - Request for New Torque Specification
   TPPSFRM3, CR/CR DATA FORM - Request for Expanded Torque Specification or Fastener Finish Change
   TPPSFRM4, CR/CR DATA FORM - Request for Design Action
   Keep this form with the Study package.

4. FSC Contact Sister Plants - In the event that other plants are producing the same vehicle, the FSC Groups in those plant should be contacted to discuss study results. Has a study been completed on the same operation? Were the results similar? Do the plants concur on a resolution to the concern? Do the plants concur on an Audit Specification?

5. Responsible Resident Engineer Review TPPS - The Study package should be reviewed with the responsible Resident Engineer and a course of action determined.

6. Requires Design Action? - Is design action required (i.e. CR/CR and Fix Alert) or is PE Notification of a Minimum Torque value required?

7. Resident Engineer Sign Inspection Limit Notification - The Inspection Limit Notification allows the Inspection Limits in the Torque Auditors' Datamytes to be changed to the required levels (determined by TPPS).

8. Assembly Plant Write Alert - A designated person in the assembly plant write an Alert. Addressees on the Alert should include the affected Resident Engineer and the sister plant FSC Coordinator(s) or Counterpart(s).

9. Audit Minimum Approved by Sister Plants - If study results from sister plants are very different and an Audit Minimum cannot be agreed upon, all data should be sent to VOGO Vehicle Fastening Systems for resolution.

10. Forward Alert to VO Vehicle Fastening Systems for Resolution - VOGO Vehicle Fastening Systems should review the data from the plant studies and determine the correct course of action.

11. Resident Engineer Forward Alert to PE as Required - The Resident Engineer shall forward the Alert to the appropriate PE.

12. Add Minimum to WERS or Issue Concern - PE to add minimum to WERS release or issue a CR/CR to implement design action to resolve the concern. It must be understood by the PE that the fastener is being secured to the Installation Torque Specification. The resulting Residual Torque, from which the Inspection Limits are derived, CANNOT be altered without a design change to the joint (i.e. Dynamic Torque Specification change, finish change, part change, etc.).

Ford

TPPS FORM #1 - INSPECTION LIMIT NOTIFICATION

Submit for all operations where the Lower Residual Limit is less than 80% of the Dynamic Torque Lower Dynamic Specification Limit

To advise the Product Engineering of the results of this study and the use of unique Residual Inspection Limits, write an Alert using the following text.

Submit this form with the TPPS data package to the effected Resident Engineer.

Plant: _____ Carline: _____ Study Completion Date: _____

Process Number: _____ Element: _____ Man Sign Wer Other

Originating Activity: _____ CPSC Code: _____ Sequence Number: _____

Description: _____

Bolt #: _____ Nut #: _____ Part #: _____

A Torque Process Potential Study was conducted on this operation. It indicates that the process variation is well within the dynamic torque specification, but the resulting residual torque is outside the specification.

Engineering Specification: ____Nm ±____Nm
Dynamic Capability: ____Pp ____Ppk
Residual Inspection Limits: ____Nm ±____Nm
Minimum Torque: ____Nm

This Alert has been issued to notify the PE of the Minimum Torque value that is the measured outcome of the process.

The study data is available upon request.

Concur:

Sister Plants contacted: _____ _____ _____ _____
Concur (Yes/No/Pending): _____ _____ _____ _____

FSC Supervisor: _____
Date

Resident Engineer: _____
Date

Alert Number _____

1/94 TPPSFRM1

CR/CR FORM #2 - Request for New Torque Specification

Submit for any operation where the Dynamic Torque Specification fails the joint or is insufficient to drive and seat the fastener.

Submit this form with the TPPS data package to the affected Resident Engineer.

Write a CR/CR and "Fix" Alert requesting the use of the corrected specification and the Minimum Static Torque. Use the following text.

Plant: _____ Carline: _____ Study Completion Date: _____

Process Number: _____ Element: _____ Man Sign War Other

Originating Activity: _____ CPSC Code: _____ Sequence Number: _____

Description: _____

Bolt #: _____ Nut #: _____ Part #: _____

A Torque Process Potential Study was conducted on this operation. It shows that the Engineering Specification ____ ± ____ Nm, _____ (falls the fastener(s) insufficient to drive and seat the fastener) A _____ (Lower/Higher) Corrected Specification is being used successfully to preclude this condition.

_____ (Failure/Minimum) Drive Torque: _____Nm

Corrected Specification: _____Nm ± _____Nm

Dynamic Capability: _____Pp _____Ppk

Minimum Torque: _____Nm

An Alert has been issued to permit the use of the Alternate Specification and the Residual Inspection limits for torque inspection. For permanent corrective action, the Corrected Specification and Minimum Residual Torque value should be released.

The study data is available upon request.

Concur:

Sister Plants contacted:	_____	_____	_____	_____
Concur (Yes/No/Pending):	_____	_____	_____	_____

FSC Supervisor: _____ Date

Resident Engineer: _____ Date

CR/CR Number: _____

1/94 TPPSFRM2

CR/CR FORM #3 - Request for Expanded Torque Specification or Fastener Finish Change

1. Submit for any operation where slip-stick friction is causing an incapable process.
2. Submit for operations where joint design or access dictates the use of a non-standard tool (i.e. tubenut, crowfoot) that is not capable within the standard ±15% tolerance.

Submit this form with the TPPS data package to the effected Resident Engineer.

Write a CR/CR requesting the necessary corrective actions. Use the following text.

Plant: _____ Cartine: _____ Study Completion Date: _____

Process Number: _____ Element: _____ Man Sign War Other

Originating Activity: _____ CPSC Code: _____ Sequence Number: _____

Description: _____

Bolt #: _____ Nut #: _____ Part #: _____

A Torque Process Potential Study was conducted on this operation. It indicates that the process cannot be kept within the Engineering Specification, ____±____Nm, due to _____
(the need for non-standard tool/slight-stick friction between components)
A finish change or other design action, or a wider Engineering Torque Specification is required to achieve capability of this joint.

Choose 1 or 2, whichever applies.
1. With the existing specifications and joint the dynamic capability is (standard tool), Pp:_____.
2. Testing of the tool (standard and non-standard) for this operation on a joint simulator indicates that the tool capability is, Pp:_____.

To achieve capability (Pp of 1.33) with the current joint design, the following Specifications are required.

Dynamic Specification: ____Nm ±____Nm
Minimum Torque: ____Nm

No interim corrective action possible. The study data is available upon request.

Concur:

Sister Plants contacted:	_____	_____	_____	_____
Concur (Yes/No/Pending):	_____	_____	_____	_____

FSC Supervisor: _____
Date

Resident Engineer: _____
Date

CR/CR Number: _____

CR/CR FORM #4 - Request for Design Action

Submit for any operation that cannot be performed to the Dynamic Torque Specifications.

Submit this form with the TPPS data package to the affected Resident Engineer.

Write a CR/CR requesting design action. Use the following text.

Plant: _____ Cartine: _____ Study Completion Date: _____

Process Number: _____ Element: _____ Man Sign Wer Other

Originating Activity: _____ CPSC Code: _____ Sequence Number: _____

Description: _____

Bolt #: _____ Nut #: _____ Part #: _____

A Torque Process Potential Study was conducted on this operation. It indicates that the process CANNOT be performed to the Engineering Torque Specification, _____±____Nm, because the minimum drive torque and fastener failure are too close together.

Minimum Drive Torque: _____Nm
Failure Torque: _____Nm

To minimize concerns, a tool set at _____Nm is being used to overcome the drive torque and the Operator attempts to release the trigger before failure occurs. This method is not reliable and will cause extreme torque scatter and some failures.

A design revision is required to obtain joint capability.

The ratio between failure torque and drive torque should be greater than 3 to 1.

Concurr:

Sister Plants contacted: _____ _____ _____ _____
Concur (Yes/No/Pending): _____ _____ _____ _____

FSC Supervisor: _____
Date

Resident Engineer: _____
Date

CR/CR Number: _____

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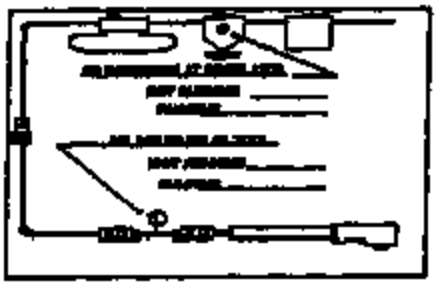
Torque Process Potential Study Worksheet

Plant:_____ Carline:_____ Date:_____

PROCESS INFORMATION:
Process No:_____ Element No:_____ DataMyte file nos: Dyn:_____ Resid:_____
Study By:_____ Control: M / S / W / N
Description:_____

Torque Specifications (Nm):
Dynamic Mean:_____ Variance +/-_____ Minimum (Stalls) _____
Tool Codes: Processed: _____ Actual: _____ Plant #: _____
Tool Manufacturer: _____ Model Number: _____
Type: Air Shut-Off / Clutch / Stall / Transducer Reaction Absorbed: Y / N
Socket Condition: _____ Length of Extension: _____ Driven: Bolt / Nut
Socket or Bit Size: _____ Transducer: _____ Bay Location: _____
Bolt #: _____ Nut #: _____ Part #: _____



Sketch of Operation

Oil Test: None / Trace / Excessive Green Band: Y / N
Torque Mean Prior To Adjustments was: _____ Nm
Remarks:_____

Study Recap

POS #	SAMPLE SIZE DYN	SAMPLE SIZE RESID	MEAN DYN	MEAN RESID	MEAN SHIFT	3 SIGMA DYN	3 SIGMA RESID	3 SIGMA DYN	3 SIGMA RESID	6 SIGMA DYN	6 SIGMA RESID	DYNAMIC Pp	DYNAMIC Ppk	RESIDUAL LOW	RESIDUAL HIGH
Range															

Revised 09/17/97/DVH

Process # _____
Joint Simulator was used to adjust tool to Dynamic Mean Torque. Y / N
(10 readings, averaged for Mean setting.)

DataMyte used for: Dynamic Torque Y / N Residual Torque Y / N
For Residual Torque, DataMyte was set to Peak Mode. Y / N
If DataMyte was not used, specify type of equipment: _____

Power Tool Air Pressure _____ PSI

TORQUE PROCESS POTENTIAL STUDY

	SPINDLE # 1		#2		#3		#4	
#	DYNAMIC	RESID	DYNAMIC	RESID	DYNAMIC	RESID	DYNAMIC	RESID
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

THIS IS THE LAST PAGE OF APPENDIX B

Study Team Progress Report

PLANT:			JOB #1 DATE:			DATE:	
CARLINE / YEAR:			FSC SIGNATURE:				
[illegible]							
TOTAL # OF STUDIES DONE THIS MONTH							
TOTAL # OF STUDIES IN THE PROGRAM							
COMMENTS:							
[illegible]							
TOTAL MANDATORY OPERATIONS							
TOTAL # COMPLETED							
# OF NEW STUDIES COMPLETED THIS MONTH							
# OF REDO STUDIES THIS MONTH							
COMMENTS:							
[illegible]							
TOTAL SIGNIFICANT OPERATIONS							
TOTAL # COMPLETED							
# OF NEW STUDIES COMPLETED THIS MONTH							
# OF REDO STUDIES THIS MONTH							
COMMENTS:							
[illegible]							
TOTAL OTHER OPERATIONS							
TOTAL # COMPLETED							
# OF NEW STUDIES COMPLETED THIS MONTH							
# OF REDO STUDIES THIS MONTH							
COMMENTS:							
[illegible]							
# OF CONCERNS / CORRECTED							
# OF REALLOCATIONS / MINISTUDIES							
COMMENTS:							
[illegible]							
# OF ALERTS WRITTEN / APPROVED							
# OF CR/GR'S WRITTEN / APPROVED							
COMMENTS:							
[illegible]							

TOTAL STUDIES	IN PROGRAM		COMPLETED		REDO		2 YR CYCLE (%)	
MANDATORY								
SIGNIFICANT								
OTHER								
TOTAL								
COMMENTS:								
REMARKS:								
VM4 ID:		PASSWORD:						

Revised on 10/30/98
TPPSMITHY

Study Team Progress Report

PLANT:			JOB #1 DATE:			DATE:		
CARLINE / YEAR:			FSC SIGNATURE:					
[illegible]			[illegible]					
TOTAL # OF STUDIES DONE THIS MONTH								
TOTAL # OF STUDIES IN THE PROGRAM								
COMMENTS:								
[illegible]								
TOTAL MANDATORY OPERATIONS								
TOTAL # COMPLETED								
# OF NEW STUDIES COMPLETED THIS MONTH								
# OF REDO STUDIES THIS MONTH								
COMMENTS:								
[illegible]								
TOTAL SIGNIFICANT OPERATIONS								
TOTAL # COMPLETED								
# OF NEW STUDIES COMPLETED THIS MONTH								
# OF REDO STUDIES THIS MONTH								
COMMENTS:								
[illegible]								
TOTAL OTHER OPERATIONS								
TOTAL # COMPLETED								
# OF NEW STUDIES COMPLETED THIS MONTH								
# OF REDO STUDIES THIS MONTH								
COMMENTS:								
[illegible]								
# OF CONCERNS / CORRECTED								
# OF REALLOCATIONS / MINISTUDIES								
COMMENTS:								
[illegible]								
# OF ALERTS WRITTEN / APPROVED								
# OF CR/CR'S WRITTEN / APPROVED								
COMMENTS:								
[illegible]								

TOTAL STUDIES	IN PROGRAM		COMPLETED		REDO		2 YR CYCLE (%)	
MANDATORY								
SIGNIFICANT								
OTHER								
TOTAL								
COMMENTS:								
REMARKS:								
VM4 ID:		PASSWORD:						

Revised on 10/30/98
TPPSMITHY

THIS IS THE LAST PAGE OF APPENDIX C

VM/ICE Database Field Codes/ICE Database Field Codes/ICE Database Field Codes

This appendix is intended as a guide for entering the data from the TPPS studies into the VM/ICE database for calculation of residual inspection limits and alert notification. The following express routines ("programs") are used:

- "ADD" - used to enter additional new studies.
- "LIMITS" - used to summarize and calculate new inspection limits and CR/Alert requirements.
- "Monthly" - used to summarize the study data for a specific month.

TPPS DATA ENTRY

When entering TPPS data into the system, the following rules should be followed:

1) Keep records in process number sequence. After executing the express routine "ADD" (see below) to get into update mode, position the cursor between the lines where the study process to be entered in sequentially. Depress the "PF-9" key and enter the number of lines to be inserted. Be sure to separate all processes with a blank line.

2) If a process is restudied, enter the new study directly below the previous one (without a blank line). Type "REPLACED" in the Elements field of the previous study.

3) After additional study lines have been added, type "RENUM" on the command line to renumbercolumn 8 to be able to maintain the process sequence.

Express Routine "ADD" (type "exp add" on the command line).

When "exp add" is entered on the command line, the columns are displayed in update mode for data entry and sequenced to the Study Worksheet format. The following codes must be used for columns 14 & 36:

Column Number:	Description and Acceptable Entries
14	Engineering problem code (more than one may apply), leave blank if not engineering problem) A = No torque specification given for the process. B = Inadequate dynamic torque specification variance - less than ± 15%. C = The drive torque overlaps the dynamic torque specification. D = The failure torque is less than the dynamic torque specification. E = Excessive slip-stick friction evident. F = Dynamic torque specification should be commonized. G = Bolt head height or recess depth is inadequate resulting in a cam out of the bolt head or recess. H = Inadequate tool clearance. I = Specified torque results in loose fastener(s) when assembled.
36	One of these codes must be in this column: O = Operation - study with a single fastener. F = Fastener - study with more than one fastener. R = Range line of a study with more than one fastener. M = Mini study (in place of "O" AND "R"). C = Comment line (no data or data, process and element number only). D = Data is with another process (list in Remarks field 32).

TPPS AUDIT LIMIT CALCULATION

Express routine "LIMITS" (type "exp limits" on command line)

The express routine "LIMITS" is executed after the study data has been entered, sorted, and stored.

When this routine is executed, the data in the "Range" and "Operation" lines (column 36) will be displayed with the following information added:

- In column 29: Residual limits needed (YES or NO), or the dynamic Ppk is below 1.33 (PpLOW).
- In column 30: Alert or CR/CR, or notification of resident engineer (ALERT, CR/CR OR NOTE).
- In column 37: The new HIGH LIMIT for residual inspection.
- In column 38: The new LOW LIMIT for residual inspection.
- Column 34 & 35: Zeros if dynamic specs are to be used for inspection limits, or Ppk is less than 1.33.

Report #2 can then be run to print the data and Report #3 to print the process description and remarks. Only the lines (rows) selected in the express routine ("O" or "R" in column 36) will be printed, if requested in conjunction with the "LIMITS" program.

Note: Be sure to STORE the file after the express routine has been executed to save all of the changes.

TPPS REPORTS

The following reports have been programmed:

#1 - Pp Ppk analysis of total data file, or pre-selected data.

#2 - Summary of data for selected operations.

#3 - Descriptions and remarks for Report #2.

#4 - Status of Alert and CR numbers.

#5 - Summary of studies for a specific month.

THIS IS THE LAST PAGE OF APPENDIX D

Inter Office

Vehicle Operations
General Office

To: Assembly Plant: Quality Managers
Final Area Managers
Material Managers
Pre-Delivery Supervisors
Fastening Systems Coordinators
Government Regulation Coordinators

April 19, 2000

cc: Marcy Fluker
Anne Stevens
James Totremit
Assembly Plant Managers
Directors of Manufacturing Operations

From: Dan Hettel

Subject: Torque Concern Reaction (In System) and Vehicle Containment
Procedure VOPFAG241, Attachment I

Reference: VOPFAG241, Torque Integrity Assurance Program For Assembly Plants

To assure quick response time for prevention of shipping vehicles with potential torque concerns identified during assembly plant torque surveillance, Attachment I has been developed for Procedure VOPFAG241.

Attachment I defines and reinforces the assembly plant reaction required to contain, inspect, rework, and release vehicles properly when a torque concern has been identified.

The direction in Attachment I was reviewed during the Government Regulation Coordinators' Conference on April 12.

Please implement the direction provided in Attachment I, effective immediately.

For any questions, please contact:

George Fenin, Supervisor
Critical Concerns
VO Final Assembly Engineering

Gavin Hang, Supervisor
Fastening Systems
VO Final Assembly Engineering

Dennis Haines, Manager
Government Regulations
VO Quality Office

D. Hettel, Manager
Tooling and Equipment Engineering
VO Final Assembly Engineering

Attachments: VOPFAG 241
Attachment I

ENG3-004 0505

OPERATING PROCEDURE
VEHICLE OPERATIONS
FORD MOTOR COMPANY

TORQUE CONCERN REACTION (IN SYSTEM) AND VEHICLE CONTAINMENT

I. ORGANIZATIONAL COMPONENTS AFFECTED

Assembly Plants:

Production Departments

Quality Control

Final Area Engineering

Fastening Systems Coordinator

Government Regulations Coordinator

Convey/Rail Yard

II. SUMMARY

This Attachment I to VOPFAG241 defines:

- The torque concern reaction to assure quick response time for prevention of shipping vehicles with potential torque concerns.
- The details of the reaction steps in Section IV, G.1.b of VOPFAG241.

III. RESPONSIBILITIES

General:

When a Torque Surveillance Inspector identifies a torque concern for which a "Torque Concern Notice" will be written, the affected assembly plant Production Supervisor must notify the Quality Manager, or designee, within five minutes. The Quality Manager will tell the Pre-Delivery Manager to stop shipping all vehicles immediately. The responsible plant personnel will implement the reaction required to contain, inspect, rework, and release vehicles properly.

Note: Managers, or designees, that provide notification and direction may vary depending plant organizational responsibilities.

Production Supervisor:
Torque Surveillance Inspector:
Quality Manager:
Pre-Delivery Supervisor:
Area Superintendent / Production Manager:

When a torque concern has been confirmed by one reading in a second sample of five (241, IV,C), then the Production Supervisor in the presence of the Torque Surveillance Inspector, will immediately call the Quality Manager with the torque concern information. This should be done within the first five (5) minutes of knowing that there is a torque concern. The Quality Manager will tell the Pre-Delivery Supervisor to stop shipping all vehicles immediately.

The Torque Surveillance Inspector will:

- Identify the rotation number of the last good surveillance reading as soon as he/she has retrieved it from the computer in the Fastening Systems Coordinator's office.
- Issue a "Torque Concern Notice" to the Production Supervisor (241, V).

The Production Supervisor will provide the rotation number to the Pre-Delivery supervisor so vehicles built before the last good rotation number can be released. Vehicles will not be released until it is known that all suspect vehicles on the property have been segregated. Every vehicle on the property and in the convoy/rail yard built after the last good rotation number must be re-torqued.

Begin hand torque wrench checking all units down line from the operation (Per 241, IV, C). Record the rotation number of the first vehicle hand torqued down line.

Run a High Option Content (HOC) Report listing of all the rotation and serial numbers from the last good reading rotation number up to the rotation number for which hand torque was started on line.

Get manpower together as quickly as possible and walk them to the Pre-delivery Supervisor to receive instructions before going to the yard to re-torque vehicles so they are not held longer than necessary. Identify all vehicles with a sticker "Okay to Ship" or an alternative method as designated by the Pre-delivery supervisor so the convoy yard can move these vehicles when they are completed.

Turn in all torque audit information including the HOC Report to the Pre-delivery supervisor for verification of all vehicles being completed or shipped without hand torque.

Pre-delivery Supervisor:
Quality Manager:
Area Superintendent / Production Manager:
Government Regulations Coordinator:

Immediately call convoy yard to "Stop Shipment" of ALL vehicles when notified by the Quality Manager that a "Torque Concern Notice" has been issued. Record all information in a logbook – who, why, when and sign the entry. The Pre-Delivery supervisor will also follow-up with the Area Superintendent and Production Manager regarding the "Stop Shipment."

Prepare a "Yard Campaign" sheet for the torque concern. This sheet will be attached to the HOC printout received from the production personnel when the yard campaign has been completed.

Assist the production personnel with direction on handling the yard campaign, e.g. how to mark the vehicles completed (Okay to Ship Sticker) or mark vehicles that may have to be returned to the plant for repairs.

Notify the convoy/rail yard a second time when the rotation number of the last good torque reading has been identified so they can ship all vehicles built before that rotation number. If a bar code is missing in the yard, do not ship the vehicle until it can be verified for rotation number. Record the time of this entry in the logbook and sign it.

When the yard campaign is completed, including all the vehicles on the plant property surrounding the plant, notify the convoy/rail yard that it is now okay to ship.

Determine if all vehicles were contained; notify the Quality Manager and the GRC by phone/e-mail of your immediate findings. Return the yard campaign documentation to the GRC as soon as possible.

IV. RECORDS

Logbook retained at the Pre-Delivery Office until last use, plus one year. (GIS1, 28.04, LU+1)

Logbook retained in the Convoy/Rail Yard until last use, plus one year. (GIS1, 28.04, LU+1)

This is the last page of Attachment I of Operating Procedure VOPFAG241.