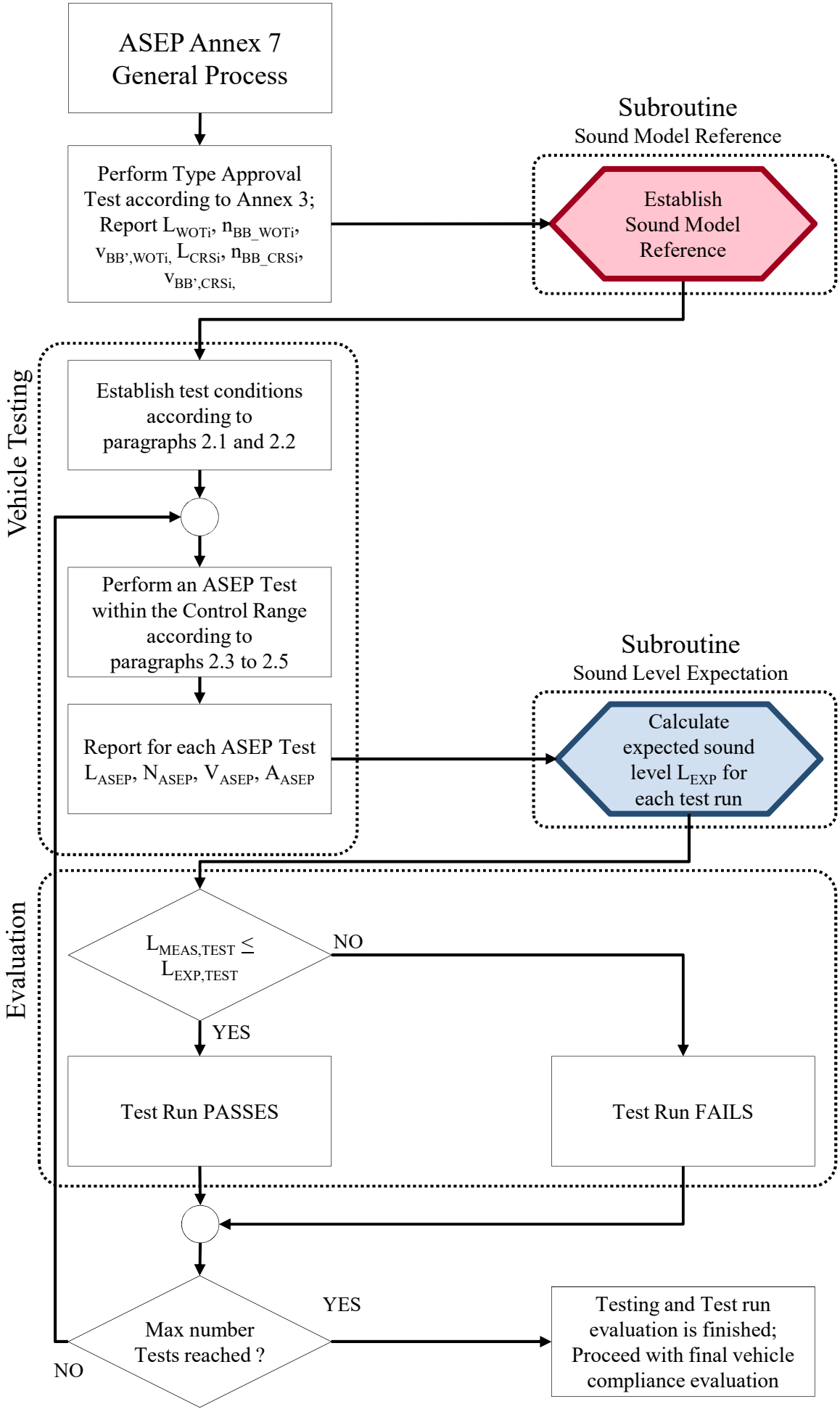
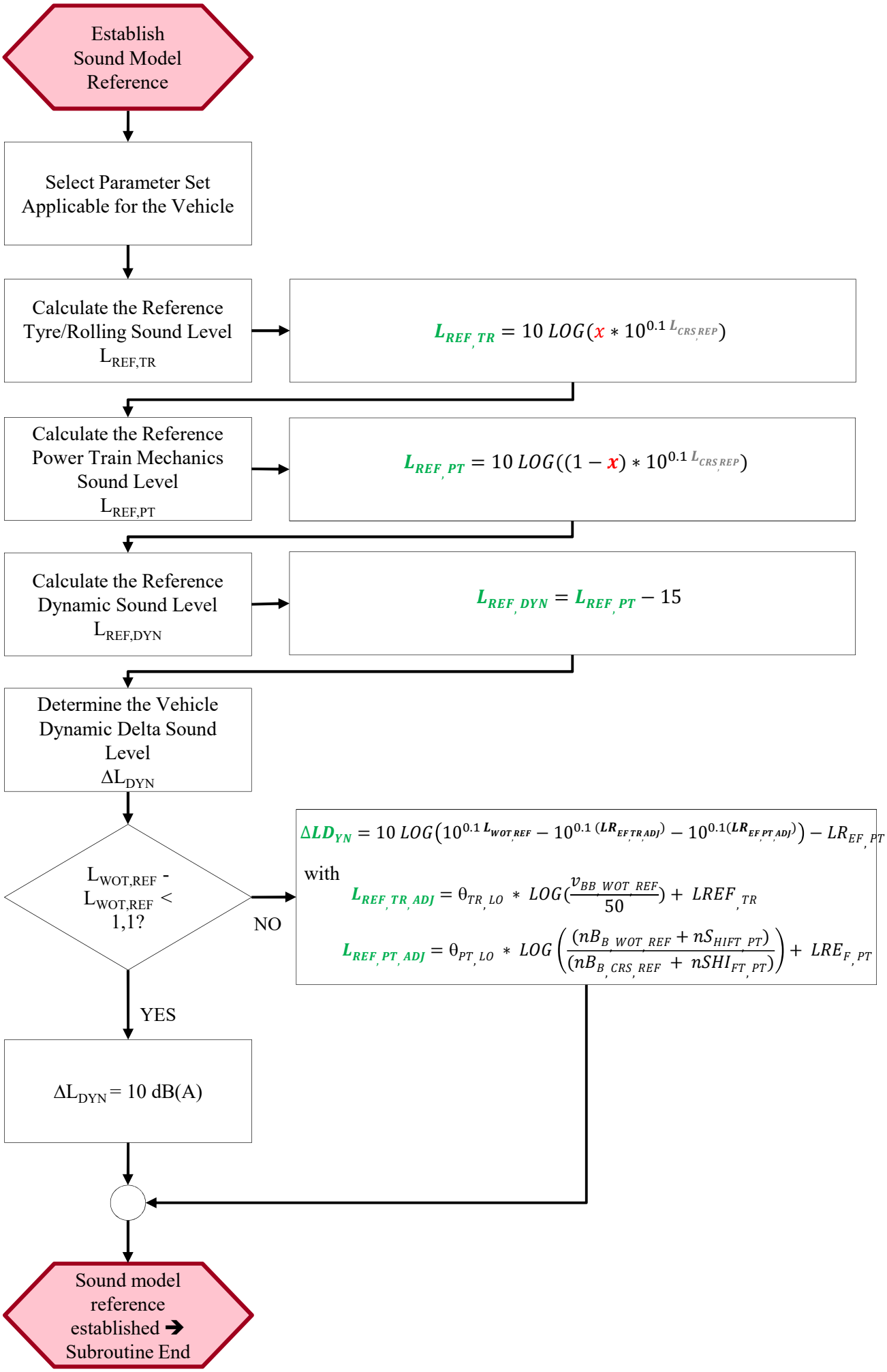
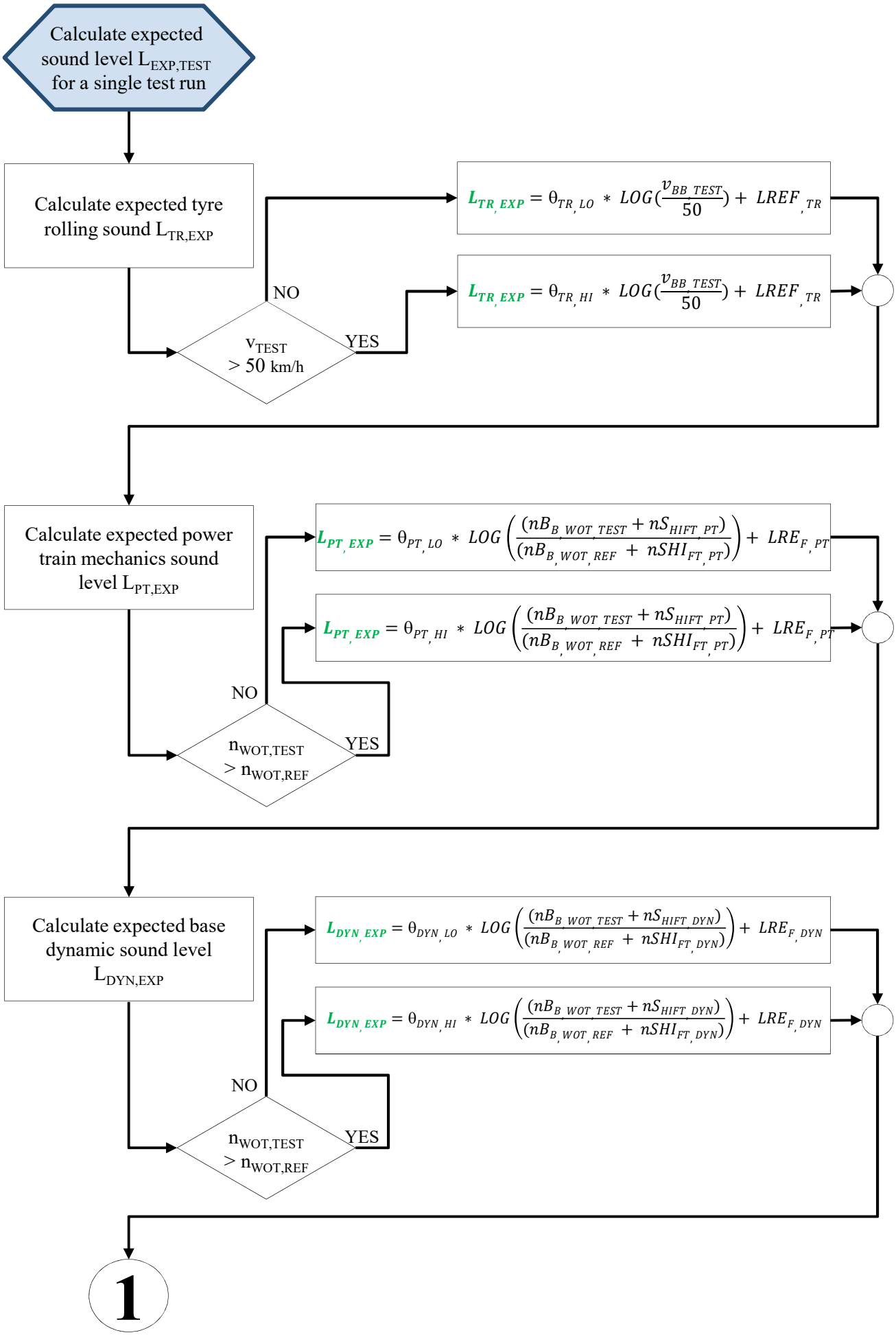
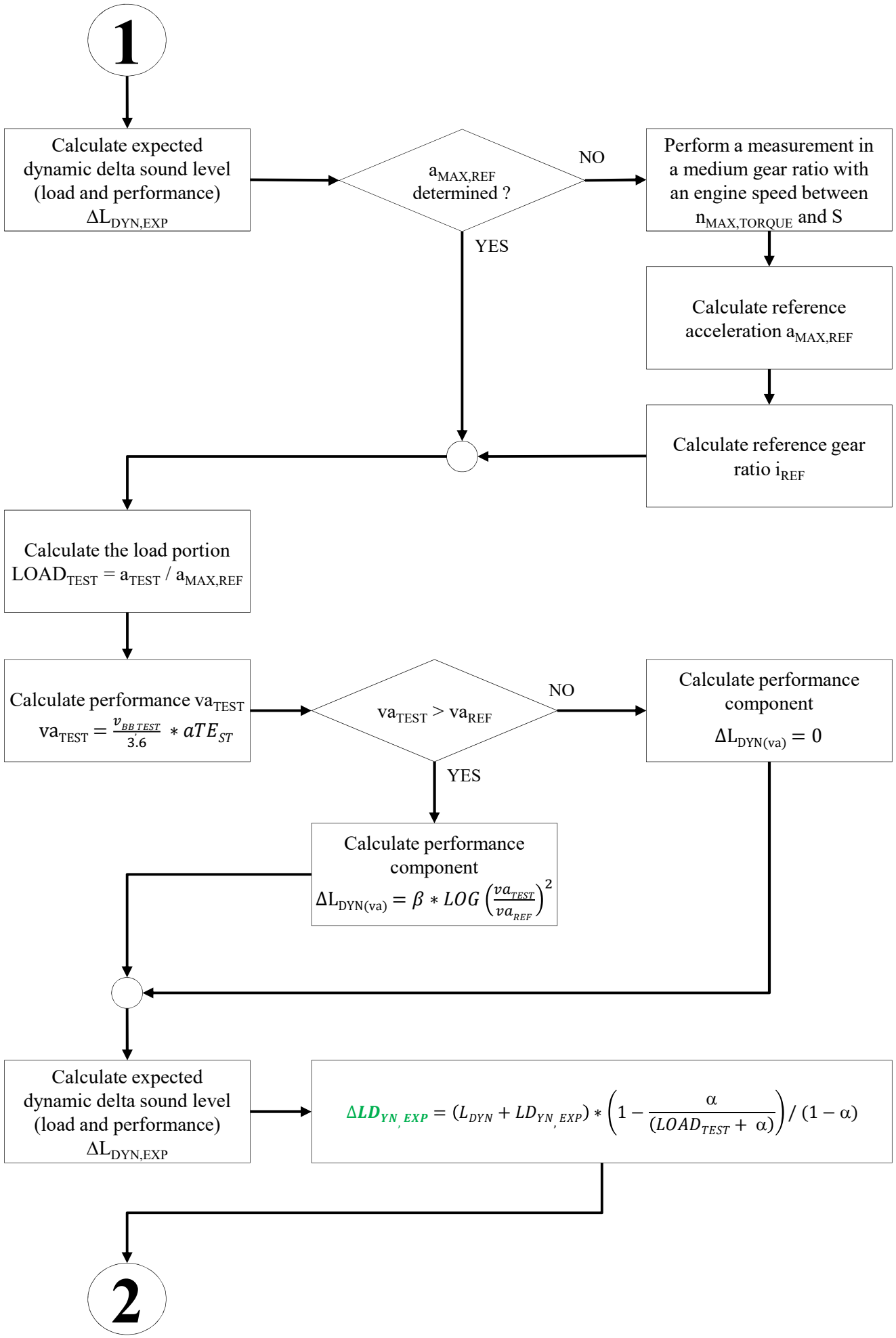
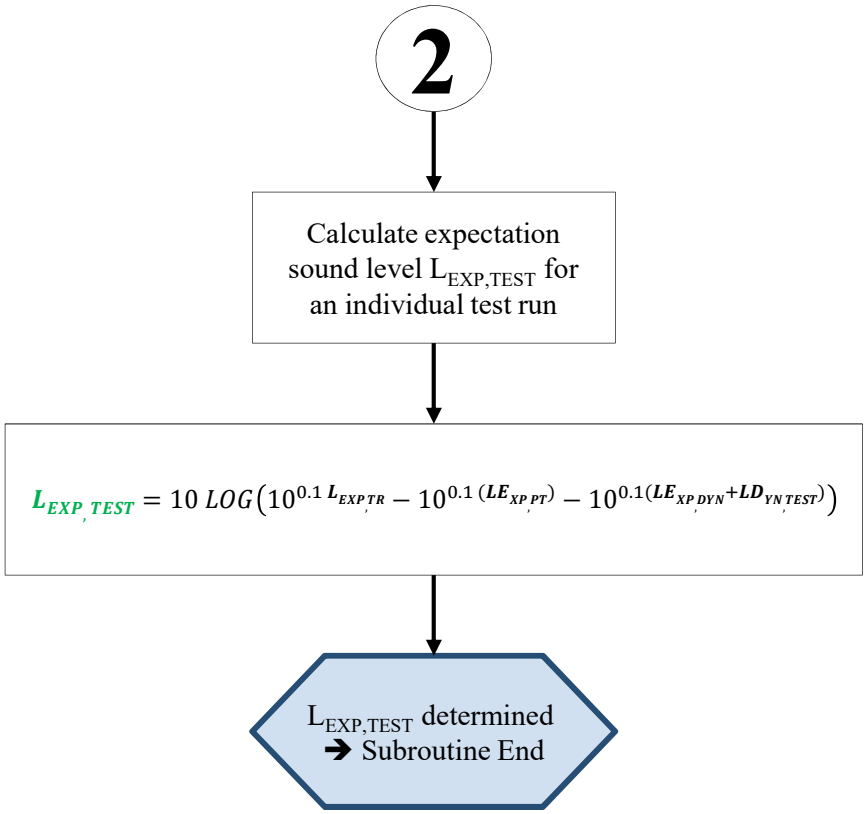

ASEP Annex 7
General Process
Perform Type Approval Test according to Annex 3; Report L_{WOTi}, n_{BB_WOTi}, $v_{BB',WOTi}$, L_{CRSi}, n_{BB_CRSi}, $v_{BB',CRSi}$,
Subroutine
Sound Model Reference
Establish Sound Model Reference
Vehicle Testing
Establish test conditions according to paragraphs 2.1 and 2.2
Perform an ASEP Test within the Control Range according to paragraphs 2.3 to 2.5
Report for each ASEP Test L_{ASEP}, N_{ASEP}, V_{ASEP}, A_{ASEP}
Subroutine
Sound Level Expectation
Calculate expected sound level L_{EXP} for each test run
Evaluation
$L_{MEAS,TEST} \leq L_{EXP,TEST}$
NO
YES
Test Run PASSES
Test Run FAILS
Max number Tests reached ?
YES
NO
Testing and Test run evaluation is finished; Proceed with final vehicle compliance evaluation


Establish Sound Model Reference
Select Parameter Set Applicable for the Vehicle
Calculate the Reference Tyre/Rolling Sound Level $L_{REF,TR}$
$L_{REF,TR} = 10\,LOG(x * 10^{0.1\,L_{CRS,REP}})$
Calculate the Reference Power Train Mechanics Sound Level $L_{REF,PT}$
$L_{REF,PT} = 10\,LOG((1-x) * 10^{0.1\,L_{CRS,REP}})$
Calculate the Reference Dynamic Sound Level $L_{REF,DYN}$
$L_{REF,DYN} = L_{REF,PT} - 15$
Determine the Vehicle Dynamic Delta Sound Level ΔL_{DYN}
$L_{WOT,REF}$ - $L_{WOT,REF}$ < 1,1?
NO
$\Delta LD_{YN} = 10\,LOG\left(10^{0.1\,L_{WOT,REF}} - 10^{0.1\,(LR_{EF,TR,ADJ})} - 10^{0.1(LR_{EF,PT,ADJ})}\right) - LR_{EF,PT}$
with
$L_{REF,TR,ADJ} = \theta_{TR,LO} * LOG(\frac{v_{BB,WOT,REF}}{50}) + LREF_{,TR}$
$L_{REF,PT,ADJ} = \theta_{PT,LO} * LOG\left(\frac{(nB_{B,WOT,REF} + nS_{HIFT,PT})}{(nB_{B,CRS,REF} + nSHI_{FT,PT})}\right) + LRE_{F,PT}$
YES
ΔL_{DYN} = 10 dB(A)
Sound model reference established ➔ Subroutine End


Calculate expected sound level $L_{EXP,TEST}$ for a single test run
Calculate expected tyre rolling sound $L_{TR,EXP}$
$L_{TR,EXP} = \theta_{TR,LO} * LOG(\frac{v_{BB,TEST}}{50}) + LREF_{,TR}$
$L_{TR,EXP} = \theta_{TR,HI} * LOG(\frac{v_{BB,TEST}}{50}) + LREF_{,TR}$
NO
YES
v_{TEST} > 50 km/h
Calculate expected power train mechanics sound level $L_{PT,EXP}$
$L_{PT,EXP} = \theta_{PT,LO} * LOG\left(\frac{(nB_{B,WOT,TEST} + nS_{HIFT,PT})}{(nB_{B,WOT,REF} + nSHI_{FT,PT})}\right) + LRE_{F,PT}$
$L_{PT,EXP} = \theta_{PT,HI} * LOG\left(\frac{(nB_{B,WOT,TEST} + nS_{HIFT,PT})}{(nB_{B,WOT,REF} + nSHI_{FT,PT})}\right) + LRE_{F,PT}$
NO
YES
$n_{WOT,TEST}$ > $n_{WOT,REF}$
Calculate expected base dynamic sound level $L_{DYN,EXP}$
$L_{DYN,EXP} = \theta_{DYN,LO} * LOG\left(\frac{(nB_{B,WOT,TEST} + nS_{HIFT,DYN})}{(nB_{B,WOT,REF} + nSHI_{FT,DYN})}\right) + LRE_{F,DYN}$
$L_{DYN,EXP} = \theta_{DYN,HI} * LOG\left(\frac{(nB_{B,WOT,TEST} + nS_{HIFT,DYN})}{(nB_{B,WOT,REF} + nSHI_{FT,DYN})}\right) + LRE_{F,DYN}$
NO
YES
$n_{WOT,TEST}$ > $n_{WOT,REF}$
1


1
Calculate expected dynamic delta sound level (load and performance) ΔL_DYN,EXP
a_MAX,REF determined ?
NO
YES
Perform a measurement in a medium gear ratio with an engine speed between n_MAX,TORQUE and S
Calculate reference acceleration a_MAX,REF
Calculate reference gear ratio i_REF
Calculate the load portion LOAD_TEST = a_TEST / a_MAX,REF
Calculate performance va_TEST
va_TEST = v_BB TEST / 3.6 * aTE_ST
va_TEST > va_REF
NO
YES
Calculate performance component ΔL_DYN(va) = 0
Calculate performance component ΔL_DYN(va) = β * LOG (va_TEST / va_REF)^2
Calculate expected dynamic delta sound level (load and performance) ΔL_DYN,EXP
ΔLD_YN,EXP = (L_DYN + LD_YN,EXP) * (1 − α / (LOAD_TEST + α)) / (1 − α)
2


2
Calculate expectation sound level $L_{EXP,TEST}$ for an individual test run
$L_{EXP,TEST} = 10\ LOG\left(10^{0.1\ L_{EXP,TR}} - 10^{0.1\ (LE_{XP,PT})} - 10^{0.1(LE_{XP,DYN}+LD_{YN,TEST})}\right)$
$L_{EXP,TEST}$ determined
➔ Subroutine End

Parameter Table

				M1		
Model Part	Parameter	Symbol	Unit	ICE	PEV	PMR < 25
TYRE	Reference Vehicle Speed	v_{REF}	km/h	50	50	40
	Tyre Rolling Sound Energy Fraction of Annex 3 Cruise Test $L_{CRS,REP}$	x	%	90	98	50
	T/R Sound Slope $\leq$ 50 km/h	$q_{TR,LO}$	dB/log(v/v_{ref})	20	20	20
	T/R Sound Slope > 50 km/h	$q_{TR,HI}$	dB/log(v/v_{ref})	40	40	40
MECHANIC NO LOAD	P/T Sound Slope $\leq$ $n_{BB,CRS,REP}$	$q_{PT,LO}$	dB/Log(n/n_{ref})	60	60	60
	P/T Sound Slope > $n_{BB,CRS,REP}$	$q_{PT,HI}$	dB/Log(n/n_{ref})	150	150	150
	Form Factor for the logarithm function of the meachanic sound model	$n_{SHIFT,PT}$	rpm	5000	5000	5000
DYNAMIC LOAD	Dynamic Sound Slope $\leq$ $n_{BB,WOT,REP}$	$q_{DYN,LO}$	dB/Log(n/n_{ref})	60	60	60
	Dynamic Sound Slope > $n_{BB,WOT,REP}$	$q_{DYN,HI}$	dB/Log(n/n_{ref})	110	110	110
	Form Factor for the logarithm function of the dynamic sound model	$n_{SHIFT,DYN}$	rpm	5000	5000	5000
DYNAMIC VxA	Reference Performance	va_{REF}	m^2/s^3	28	28	28
	Dynamic v_xa Factor b	b	dB(A)	8	8	8
	Partial Load Form Factor a	a	---	0,111	0,111	0,111
GENERAL	Base Margin	m	dB(A)	2	2	2