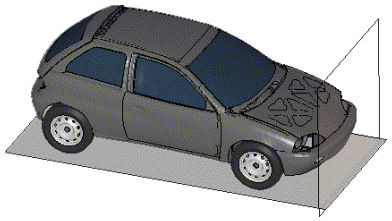
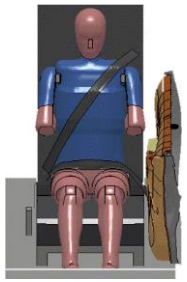
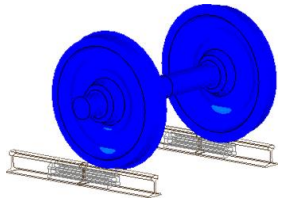
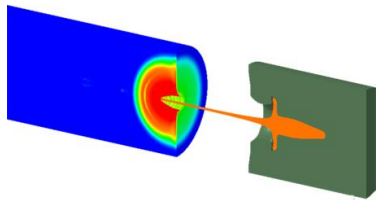
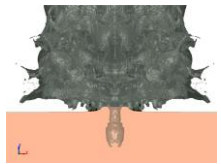
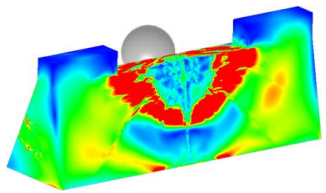












اللهم عجل لوليك الفرج

Online Course

Simulation and Numerical Modeling of Engineering Problems using

LS-DYNA

Course instructor

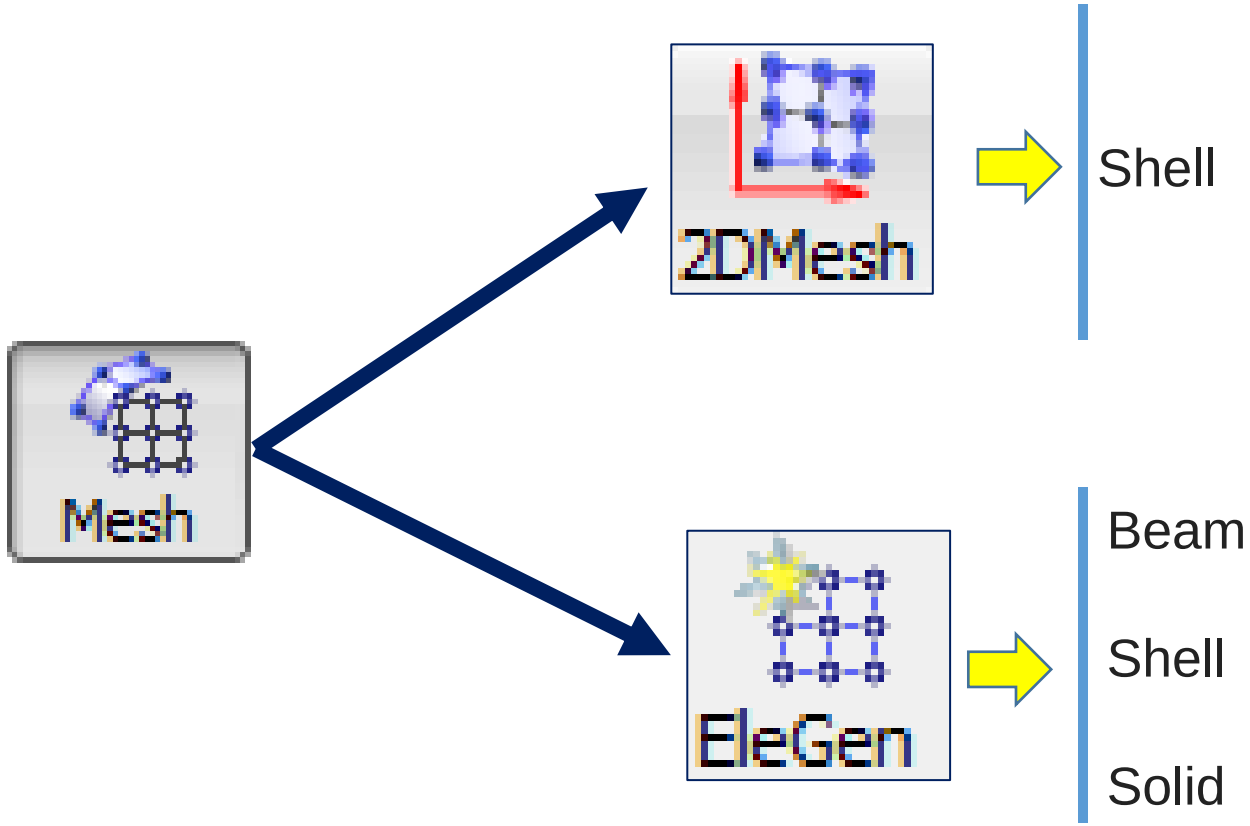
Ahmad Rahmati-Alaei

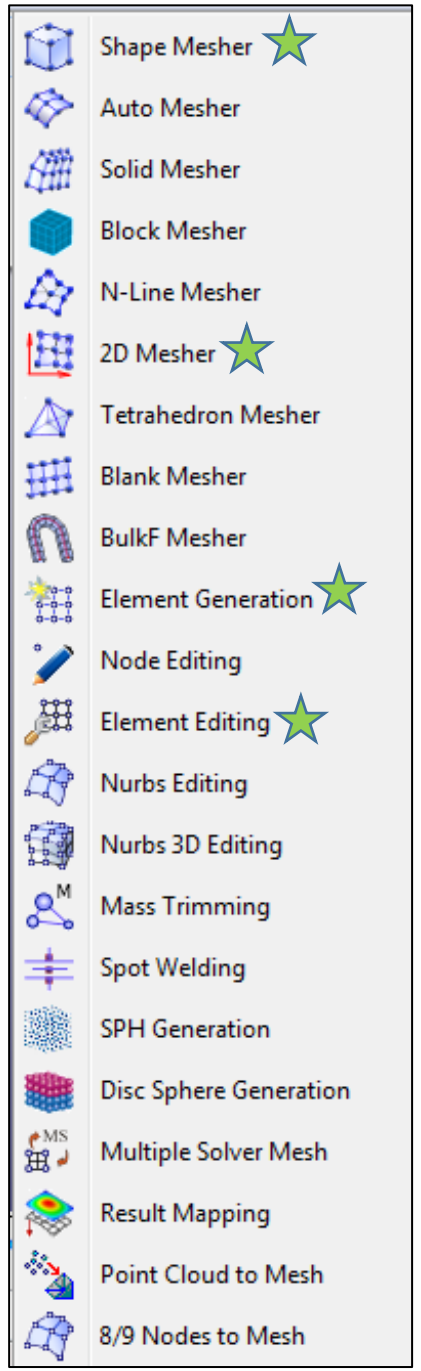
Assistant Professor, Department of Mechanical Engineering
National University of Skills (NUS), Tehran, Iran

Part 4

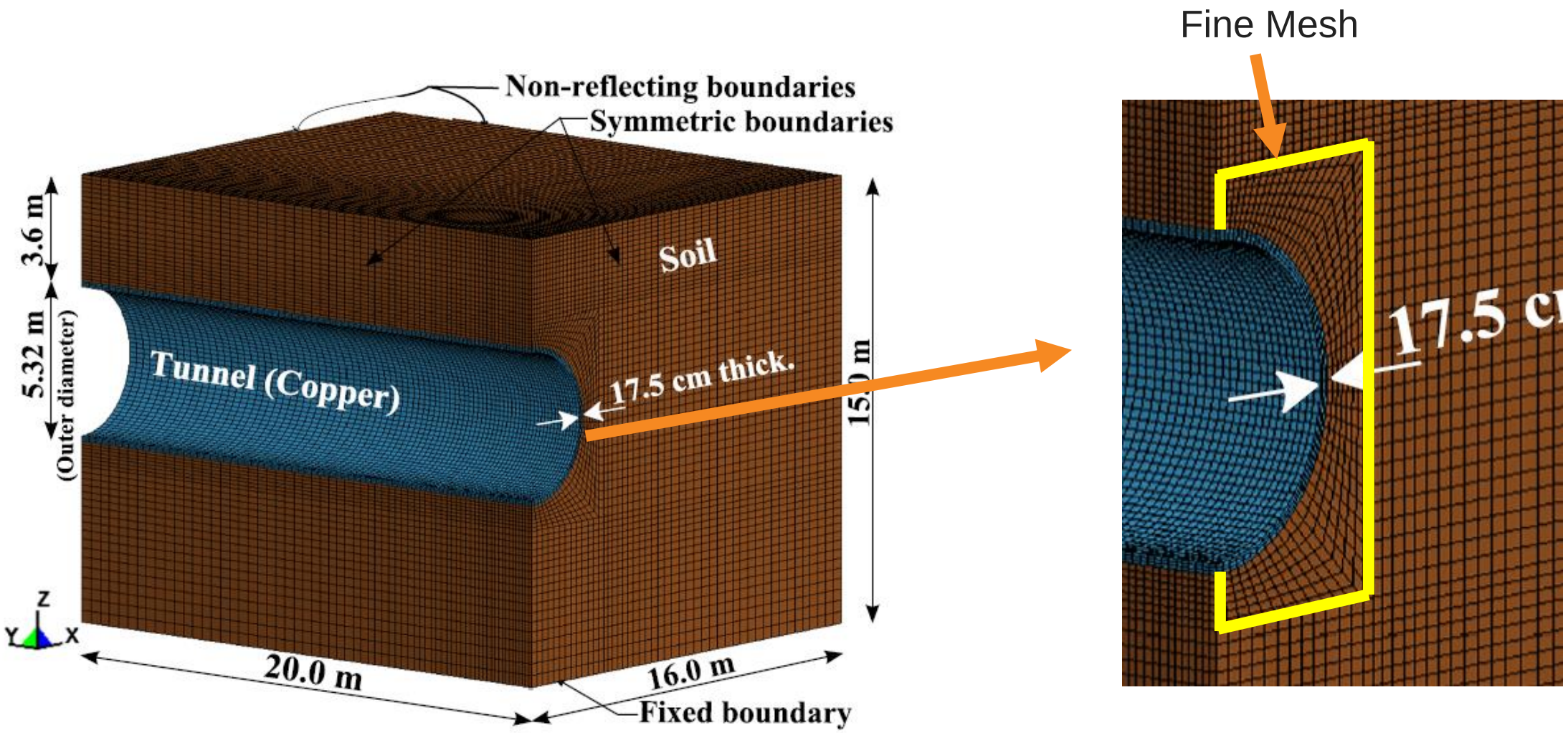
1. *Meshing Tools (2D-Mesher, Element Generation)*
2. *Element Quality Criteria (Mesh Quality Check)*
3. *Bending of Reinforced Concrete Slab Simulation*

Meshing Tools (2D Mesher, Element Generation)



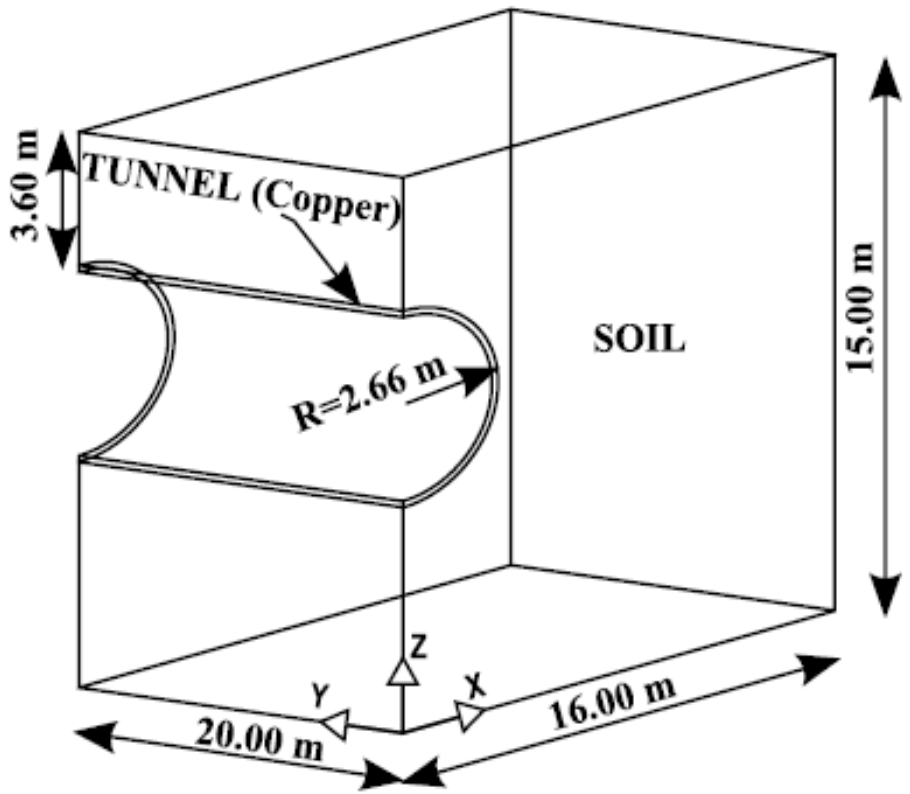


Meshing Tools (2D Mesher, Element Generation)

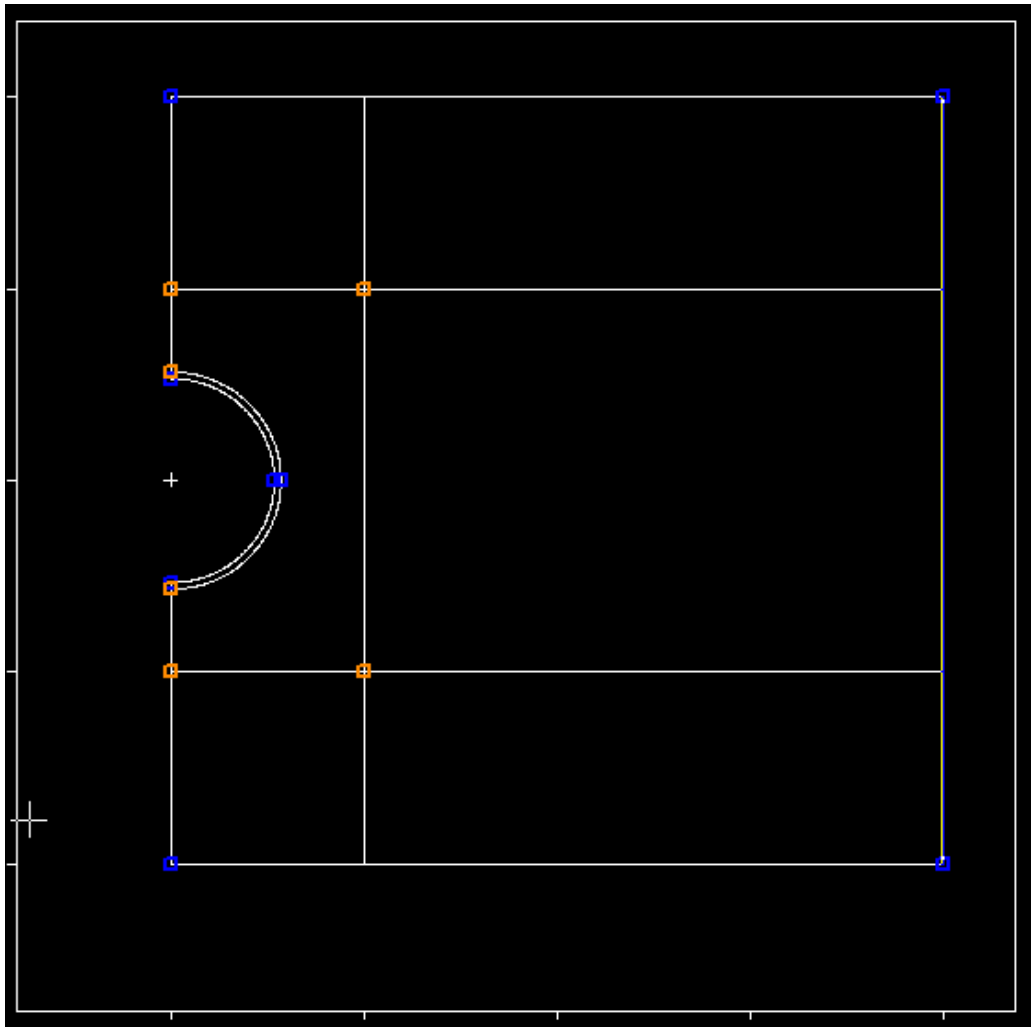


Koneshwaran, S., Thambiratnam, D. P., & Gallage, C. (2015). Performance of buried tunnels subjected to surface blast incorporating fluid-structure interaction. Journal of Performance of Constructed Facilities, 29(3), 04014084.

Meshing Tools (2D Mesher, Element Generation)



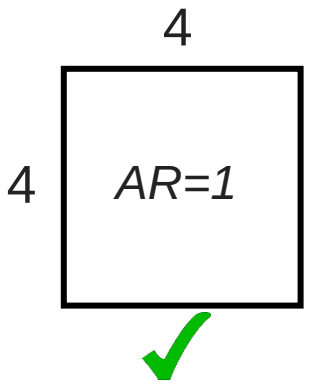
A quarter symmetrical model

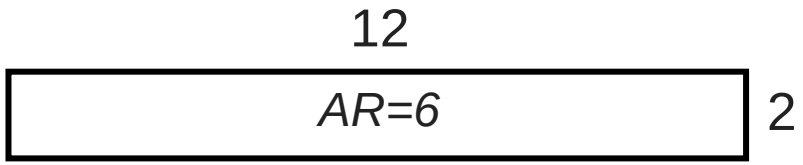


Element Quality Criteria (Mesh Quality Check)

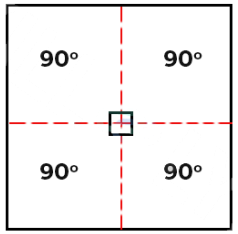
2D - Element Quality Criteria

$$Aspect\ Ratio = \frac{Maximum\ Length}{Minimum\ Length}$$





$$Skewness = 90^{\circ} - (\theta min)$$



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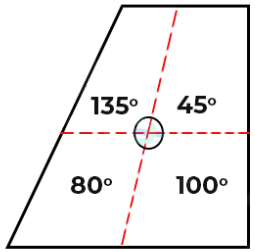

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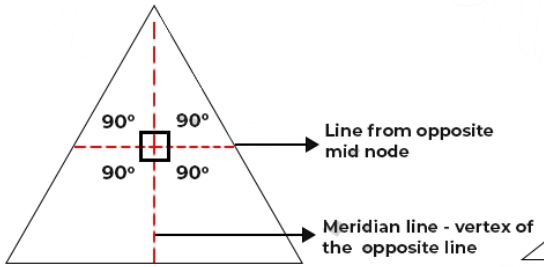

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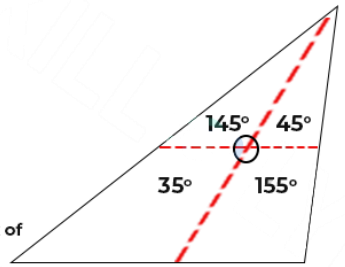


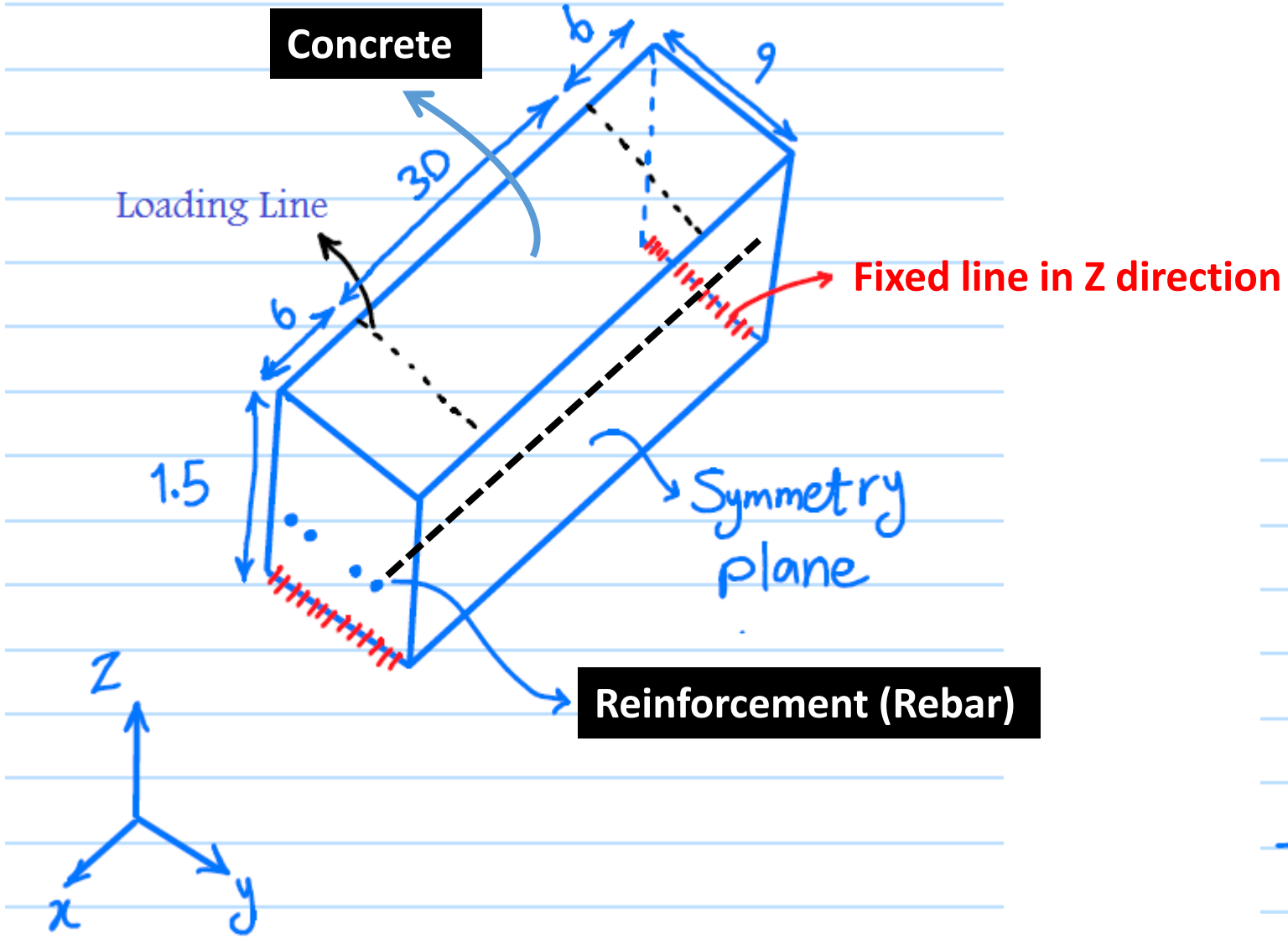
SK=55

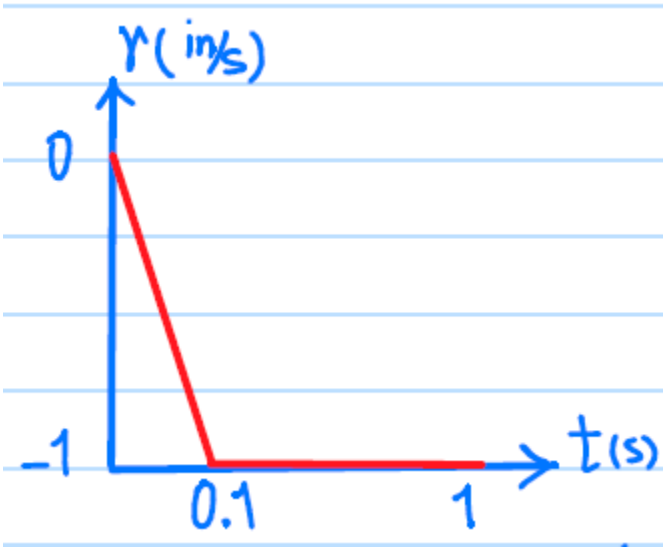
Element Quality Criteria (Mesh Quality Check)

Quality criterion	Typical threshold
Aspect ratio	3
Skewness	45°
Tapering	0.25
Jacobian	0.7

https://2021.help.altair.com/2021/hwdesktop/hm/topics/pre_processing/meshing/element_quality_how_its_calculated_c.htm

Bending of Reinforced Concrete Slab Simulation





Velocity-Time of Loading line

Bending of Reinforced Concrete Slab Simulation

Sample for Steel

MASS	LENGTH	TIME	FORCE	STRESS	ENERGY	DENSITY	YOUNG's Modulus	GRAVITY
kg	m	s	N	Pa	J	7.83e+03	2.07e+11	9.806
kg	cm	s	1.0e-02 N			7.83e-03	2.07e+09	9.806e+02
kg	cm	ms	1.0e+04 N			7.83e-03	2.07e+03	9.806e-04
kg	cm	us	1.0e+10 N			7.83e-03	2.07e-03	9.806e-10
kg	mm	ms	kN	GPa	kN-mm	7.83e-06	2.07e+02	9.806e-03
g	cm	s	dyne	dyne/cm²	erg	7.83e+00	2.07e+12	9.806e+02
g	cm	us	1.0e+07 N	Mbar	1.0e+07 Ncm	7.83e+00	2.07e+00	9.806e-10
g	mm	s	1.0e-06 N	Pa		7.83e-03	2.07e+11	9.806e+03
g	mm	ms	N	MPa	N-mm	7.83e-03	2.07e+05	9.806e-03
ton	mm	s	N	MPa	N-mm	7.83e-09	2.07e+05	9.806e+03
g	cm	ms	1.0e+1 N	1.0e+05 Pa		7.83e+00	2.07e+06	9.806e-04
kg	mm	s	mN	1.0e+03 Pa		7.83e-06	2.07e+08	9.806e+03
lbf-s²/in	in	s	lbf	psi	lbf-in	7.33e-04	3.00e+07	386
slug	ft	s	lbf	psf	lbf-ft	1.52e+01	4.32e+09	32.17
kgf-s²/mm	mm	s	kgf	kgf/mm²	kgf-mm	7.98e-10	2.11e+04	9.806e+03

Mesh	• Shape Mesher • Element Generation
Geometry	• Curve -> Line
Loading Curve	• Define -> Curve
Boundary Condition	• Boundary -> SPC SET • Boundary -> Prescribed Motion Set
Material	• MAT -> Plastic Kinematic (MAT 003) • MAT -> CSCM Concrete
Section	• Section -> Beam • Section -> Solid
Termination	• Control -> Termination
Time Step	• Database -> Binary D3plot • Database -> ASCII Option • Database -> History Node
Contact	• Definition of Interaction of Beam & Solid elements • Constrained-> Lagrange in Solid

Course instructor

Ahmad Rahmati-Alaei

Assistant Professor, Department of Mechanical Engineering
National University of Skills (NUS), Tehran, Iran

AhmadRahmati16@gmail.com