

## 1 Collision of truck with steel frame

Here is considered collision of truck with the column of the steel frame. The speed of the truck is 30 km/hour.

The following characteristics has been considered:

$$F = ma \text{ (N)},$$

where:

F – force, applied for the frame

m – weight of truck

a – velocity as function of  $\Delta V / \Delta t$ , where

Energy of impact may be calculated as follows:

$$E = 1/2 m V^2 \text{ (J)},$$

E – kinetic energy, J

m – weight of truck, kg

V – velocity, m/s

$$W = Fs \text{ (J)},$$

W – job, J

s – distance, travelled by truck from the collision till total stop, m

$$Fs = 1/2 m V^2 \Rightarrow F = (1/2 m V^2) / s$$

### CALCULATION :

*Initial data:*

$$m = 18000 \text{ kg}; V = 8.34 \text{ m/s}; S = 0.7 \text{ m};$$

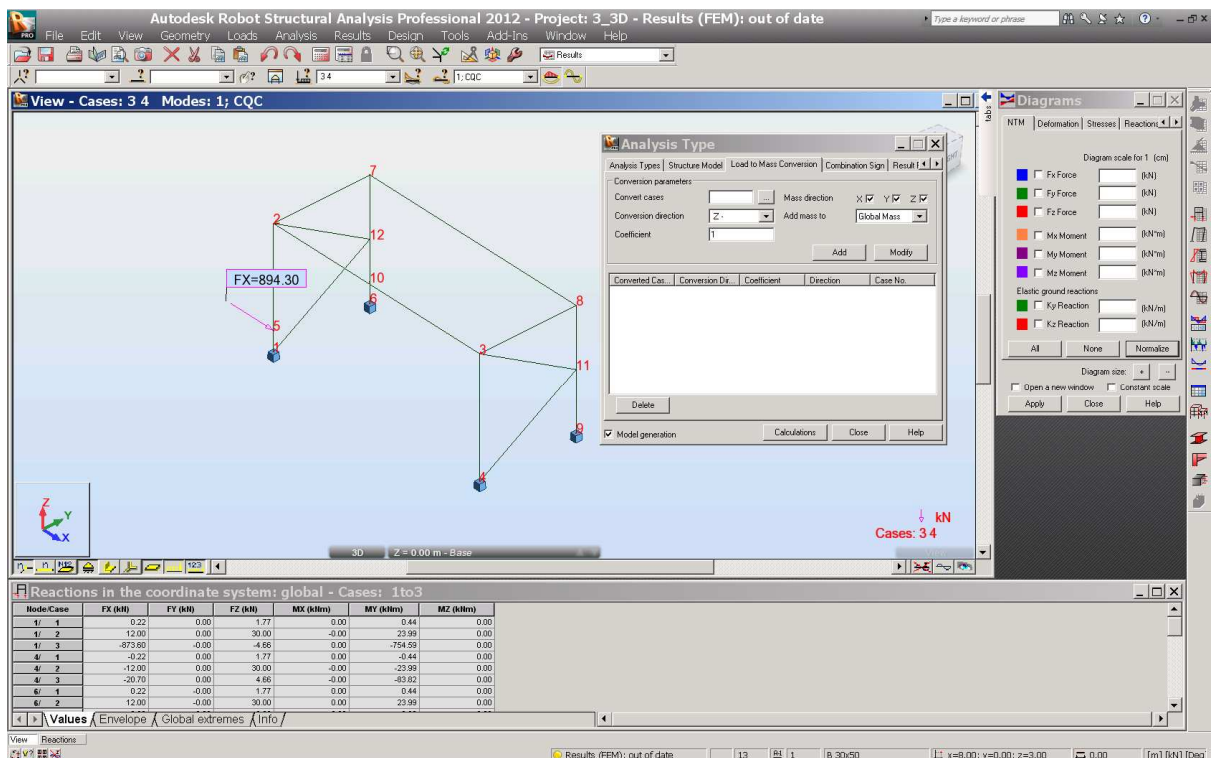
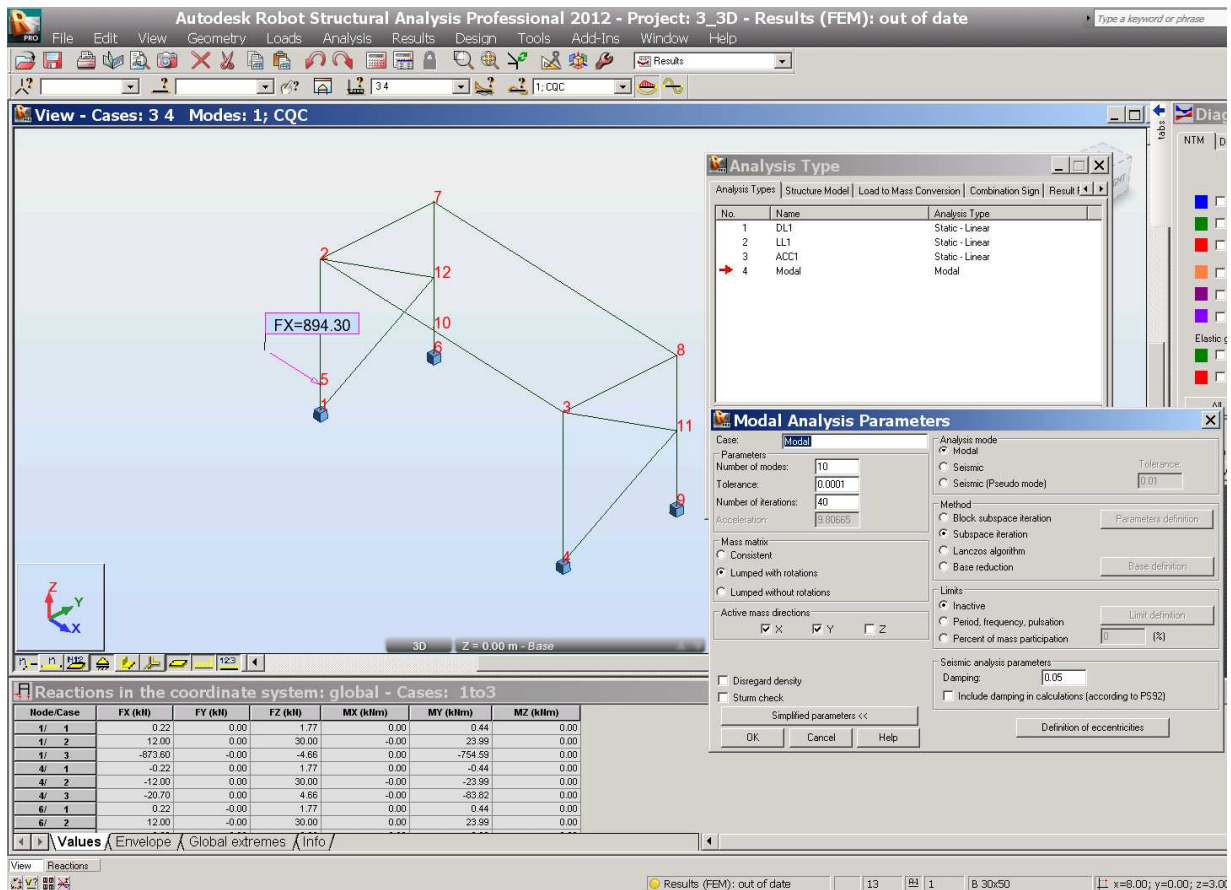
*Calculation of force F:*

$$F = (1/2 * 18000 * 8.34^2) / 0.7 = 894,3 \text{ kN}$$

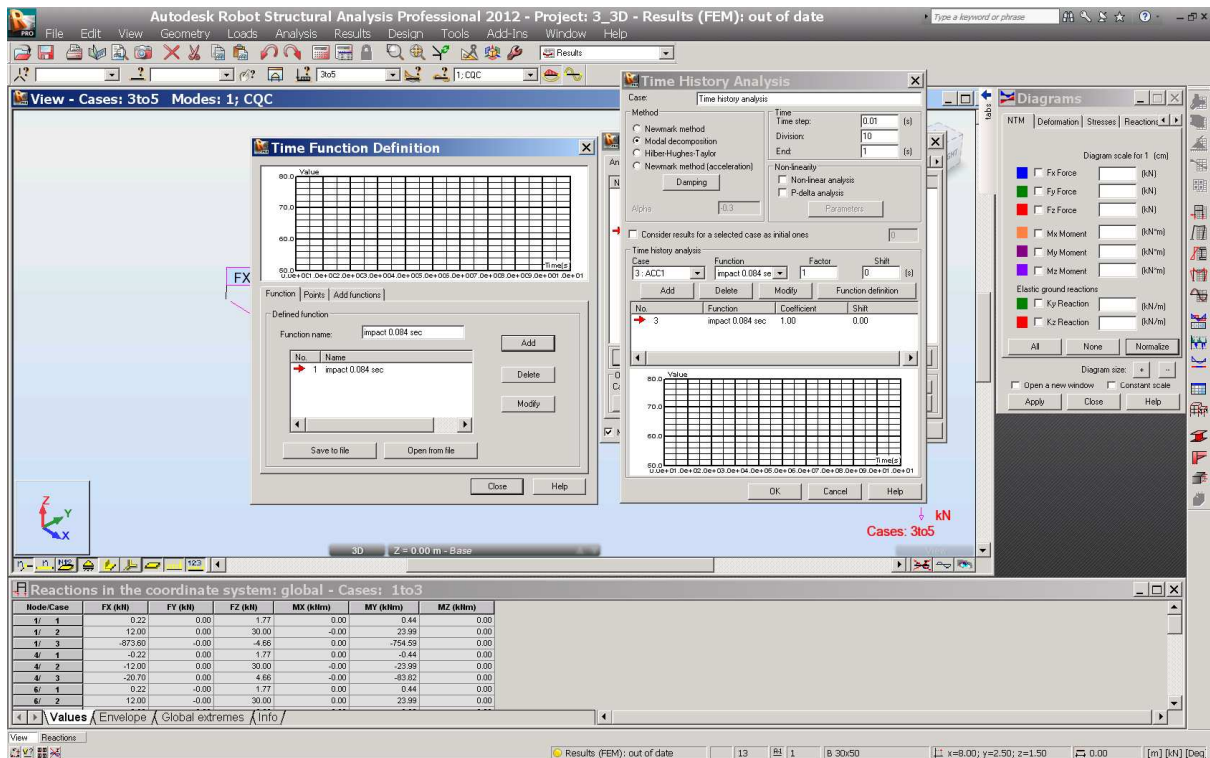
1) Is this correct to calculate  $\Delta t$  – duration of impact as :

$$\Delta t = s / V = 0.7 \text{ m} / 8.34 \text{ m/s} = 0.084 \text{ s} \quad ???$$

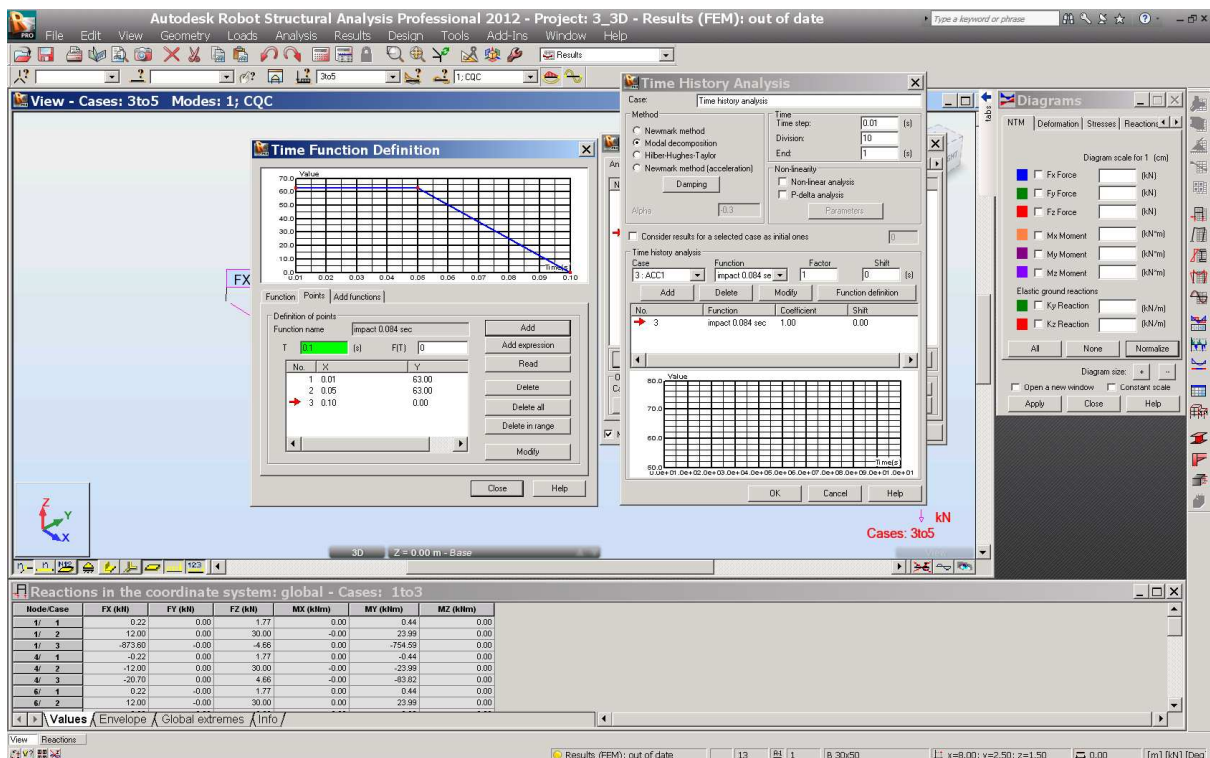
2) Also, please, see questions below



Comment – no masses has been added like in your example. Is this correct ?



For the Time history analysis I used this preferences



I put 3 Points(0.01 s, 0.05s, 0.1s) , relevant to points values F(T) I put 63 and 0. I PUT THEM JUST FOR FUN. I don't understand that it is. Could you please comment it ?

## RESULTS

Autodesk Robot Structural Analysis Professional 2012 - Project: 3\_3D - Results (FEM): ou

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1to24 2to14 4: Modal 1..10; CQC

### Dynamic Analysis Results - Case: 4 (Modal ) Active modes: 1..10; CQC

Case/Mode	Frequency (Hz)	Period (sec)	Rel.mas.UX (%)	Rel.mas.UY (%)	Rel.mas.UZ (%)	Cur.mas.UX (%)	Cur.mas.UY (%)	Cur.mas.UZ (%)	Total mass UX (kg)	Total mass UY (kg)	Total mass UZ (kg)
4/ 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Analysis Type

Analysis Types | Structure Model | Load to Mass Conversion | Combination Sign | Result f

No.	Name	Analysis Type
1	DL1	Static - Linear
2	LL1	Static - Linear
3	ACC1	Static - Linear
4	Modal	Modal
5	Time history analysis	Time history

New Parameters Change analysis type Delete

Operations on selection of cases

Case list

Set parameters Change analysis type Delete

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I didn't got any results

Autodesk Robot Structural Analysis Professional 2012 - Project: 3\_3D - Results (FEM): out of date

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1to24 2to14 3to5 1..CQC

### Dynamic Analysis Results - Case: 4 (Modal ) Active modes: 1..10; CQC

Case/Mode	Frequency (Hz)	Period (sec)	Rel.mas.UX (%)	Rel.mas.UY (%)	Rel.mas.UZ (%)	Cur.mas.UX (%)	Cur.mas.UY (%)	Cur.mas.UZ (%)	Total mass UX (kg)	Total mass UY (kg)	Total mass UZ (kg)
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4/ 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/ 7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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PHASE OF ANALYSIS

Bandwidth Optimization

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Damping defined in supports/releases is not considered in the modal decomposition method in the time history analysis

OK

Operations on selection of cases

Case list

Set parameters Change analysis type Delete

Model generation Calculations Close Help

Also here ...