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Robot Structural Analysis API Add-Ins as Benefits for Structural Design Modeling

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Learning Objectives

- Discover how to transfer your structural design or modeling needs into Robot Structural Analysis add-in
- Get a firsthand impression of the Robot Structural Analysis API
- Get answers to Robot Structural Analysis API programming questions
- Meet Robot Structural Analysis Support Team members and provide feedback to them

Description

Custom-tailored software has never been easier to achieve in Robot Structural Analysis software. If you're writing, or willing to write, add-ins for Robot Structural Analysis to expand its capabilities, this is the perfect place to get to know the subject and meet the people who use the Robot Structural Analysis API.

Speaker

Rafal Gaweda - 1995-1997, Assistant Professor, Cracow University of Technology, Civil Engineering Department1997-2001 , Tech Support and Training Engineer, RoboBAT2002-2007, CAD \ FEM software consultant2007-2008 , Tech Support and Training Engineer, RoboBAT2008 - Product Support Specialist , Autodesk Inc.2013 - Senior Product Support Specialist , Autodesk Inc.

API - Application Programming Interface

Robot Structural Analysis, as most of the software, has its own programming interface. It allows to control Robot by external applications or add-ins.

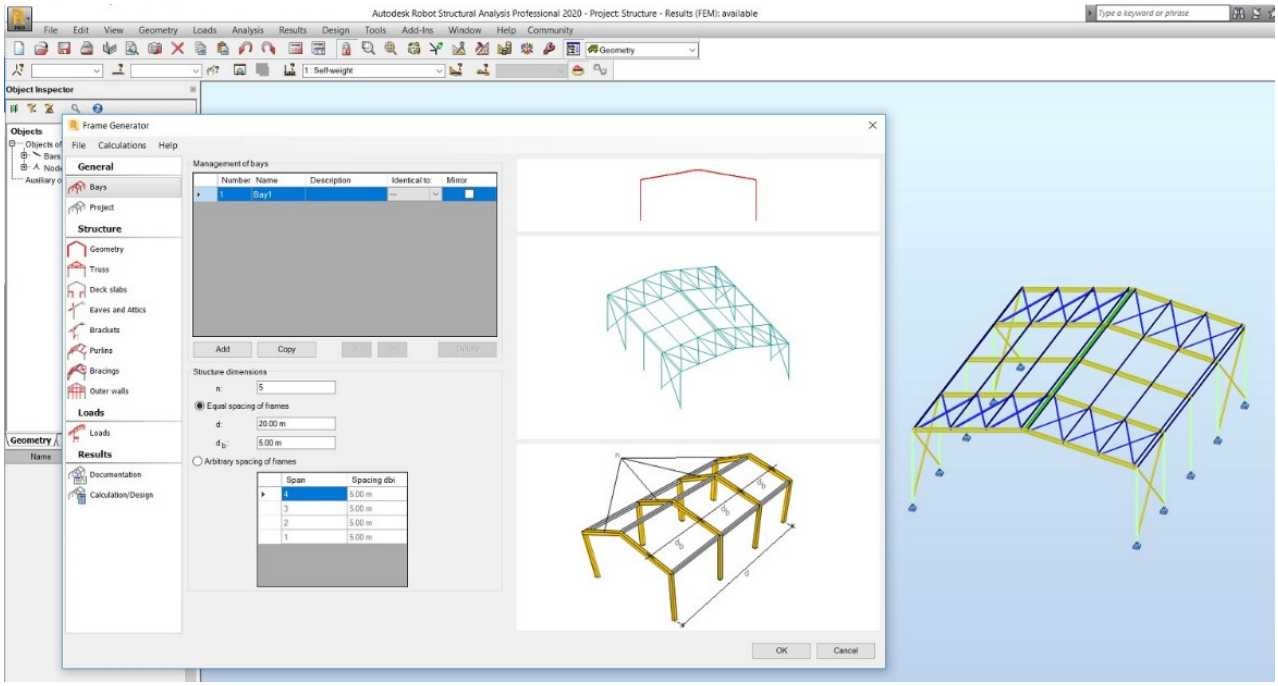
Level of access:

- Complete model data input \ modification
- Results exploration
- View management
- Printout creation
- Running Design

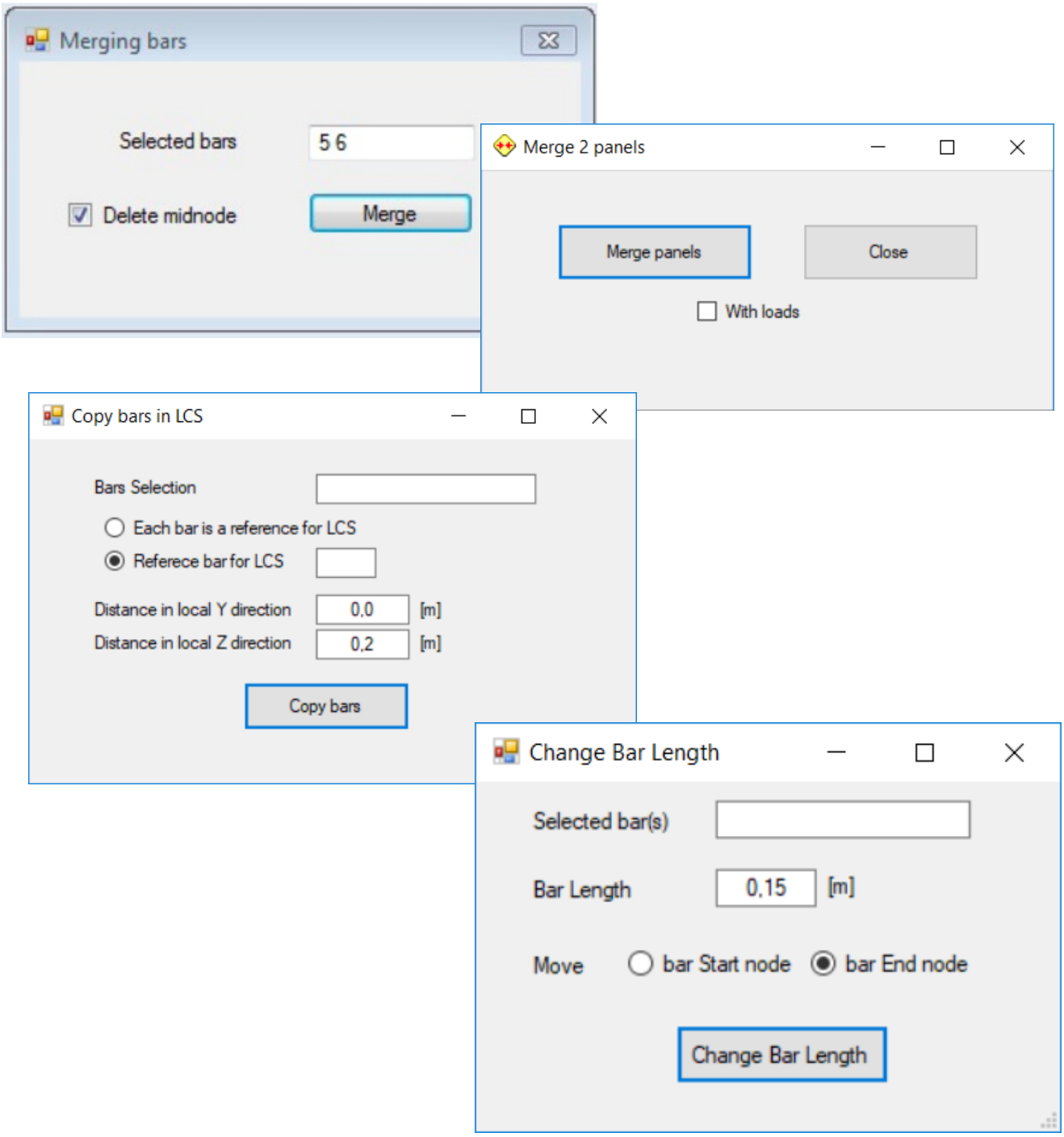
Programming can be made in VBA (for example in Excel or Word), VB, C#, C++.

During this class small macro will be developed to give You impression how easy and fast it can be to adjust software to Your needs.

A bit of programming knowledge let us to automatize design processes



Gives us possibility to develop features for Robot



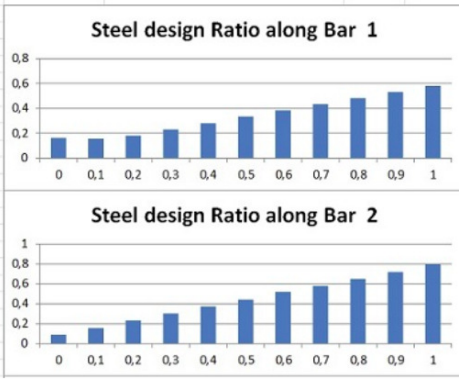
Presents results in different way

Member Verification ULS Ratio along bar length

Project	model
Bars	1 2 4
Load cases	1to19
Number of calculation points	11

Get data from Robot

Bar	Case	Point	Ratio
1	16 KOMB8	0	0,159615379
	16 KOMB8	0,1	0,157561443
	11 KOMB3	0,2	0,176806315
	16 KOMB8	0,3	0,228228452
	16 KOMB8	0,4	0,280395241
	16 KOMB8	0,5	0,331850813
	16 KOMB8	0,6	0,382595169
	16 KOMB8	0,7	0,432628308
	16 KOMB8	0,8	0,481950231
	16 KOMB8	0,9	0,530560938
	16 KOMB8	1	0,578460429
2	11 KOMB3	0	0,086972579
	11 KOMB3	0,1	0,158545129
	11 KOMB3	0,2	0,229996961
	11 KOMB3	0,3	0,301328072
	11 KOMB3	0,4	0,372538465
	11 KOMB3	0,5	0,443628137
	11 KOMB3	0,6	0,514597091
	11 KOMB3	0,7	0,579253192
	11 KOMB3	0,8	0,649466863
	11 KOMB3	0,9	0,719559816
	11 KOMB3	1	0,78974544



Internal Forces

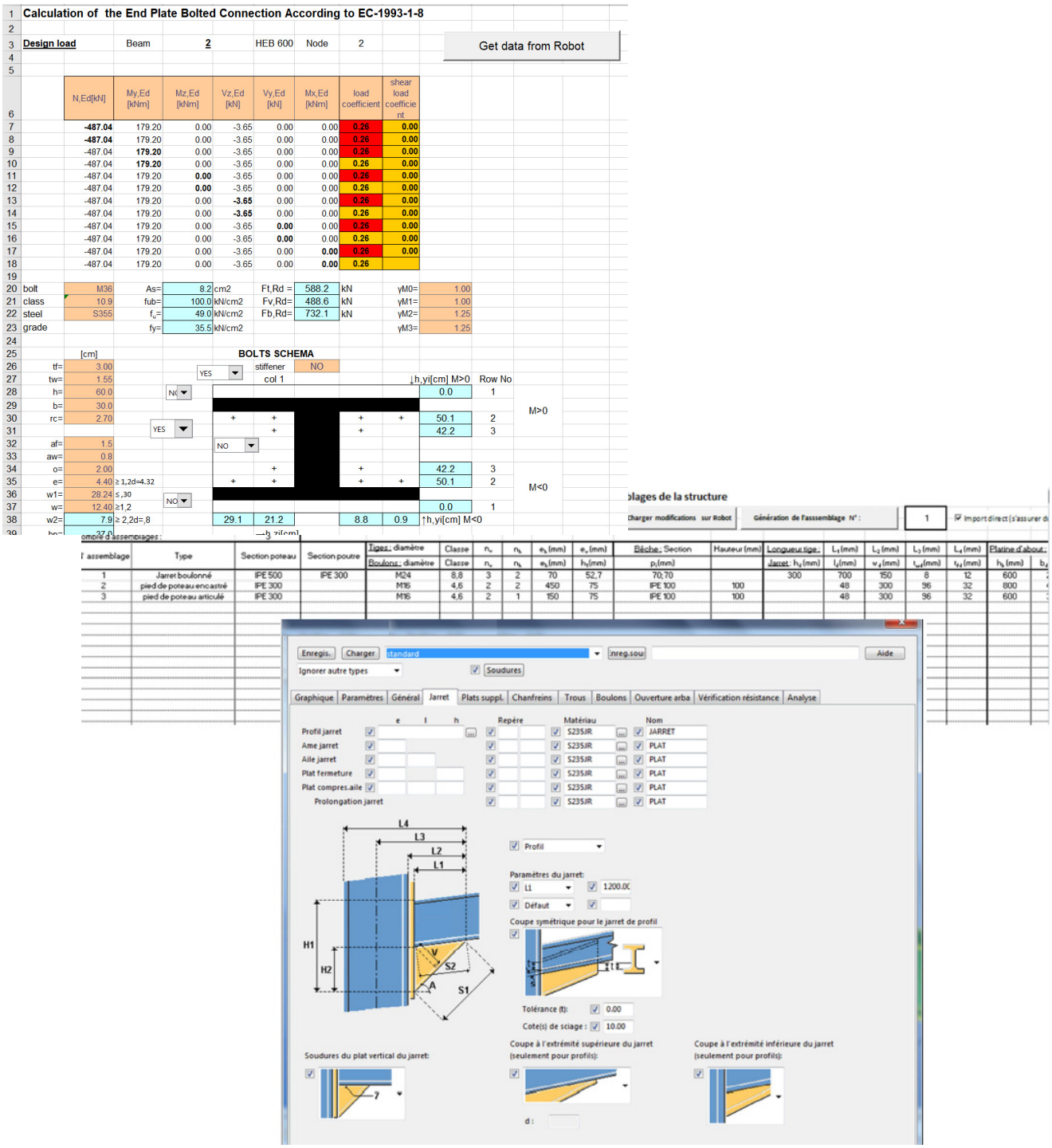
Project	s1.rtd
Bars	1
Load cases	7 8
Number of points along the bar	5

Get data from Robot

Bar	Node	Case (/ Component)	FX -[kN]	FX+ [kN]	FY [kN]	FZ [kN]	MX [kNm]	MY [kNm]	MZ [kNm]	SQR
1	1	7		567.87264	-4.05	64.8	0	-513.6394313	-393.0444612	571.5578494
1	1	8		567.87264	-4.05	64.8	0	-513.6394313	-393.0444612	571.5578494
1	2 / 5	7		544.02948	-4.05	48.6	0	-330.4673987	-351.659941	546.1959677
1	2 / 5	8		544.02948	-4.05	48.6	0	-330.4673987	-351.659941	546.1959677
1	3 / 5	7		520.18632	-4.05	32.4	0	-177.8116488	-260.5171945	521.1943664
1	3 / 5	8		520.18632	-4.05	32.4	0	-177.8116488	-260.5171945	521.1943664
1	4 / 5	7		496.34316	-4.05	16.2	0	-65.45397577	-136.733842	496.6074632
1	4 / 5	8		496.34316	-4.05	16.2	0	-65.45397577	-136.733842	496.6074632
1	2	7		472.5	-4.05	1.4797E-10	0	4.08201E-11	7.35481E-11	472.5
1	2	8		472.5	-4.05	1.4797E-10	0	4.08201E-11	7.35481E-11	472.5

	Value	Case (/ Component)	Bar	Node
MaxSQR	571.5578494	7	1	1
MaxMy	4.08201E-11	7	1	2
MinMy	-513.6394313	7	1	1
MaxMz	7.35481E-11	7	1	2
MinMz	-393.0444612	7	1	1
MaxMx	0	7	1	1
MinMx	0	7	1	1
MaxFx	567.87264	7	1	1
MinFx	0	7	1	1
MaxFy	-4.05	7	1	4 / 5
MinFy	-4.05	7	1	2
MaxFz	64.8	7	1	1
MinFz	1.47972E-10	7	1	2

Allow to run our own calculations or design based on imported results



Calculation of the End Plate Bolted Connection According to EC-1993-1-8

Design load | Beam 2 | HEB 600 | Node 2 | Get data from Robot

N,Ed[kN]	My,Ed [kNm]	Mz,Ed [kNm]	Vz,Ed [kN]	Vy,Ed [kN]	Mx,Ed [kNm]	load coefficient	shear load coefficient
-487.04	179.20	0.00	-3.65	0.00	0.00	0.26	0.00
-487.04	179.20	0.00	-3.65	0.00	0.00	0.26	0.00
-487.04	**179.20**	0.00	-3.65	0.00	0.00	0.26	0.00
-487.04	**179.20**	0.00	-3.65	0.00	0.00	0.26	0.00
-487.04	179.20	**0.00**	-3.65	0.00	0.00	0.26	0.00
-487.04	179.20	**0.00**	-3.65	0.00	0.00	0.26	0.00
-487.04	179.20	0.00	**-3.65**	0.00	0.00	0.26	0.00
-487.04	179.20	0.00	**-3.65**	0.00	0.00	0.26	0.00
-487.04	179.20	0.00	-3.65	**0.00**	0.00	0.26	0.00
-487.04	179.20	0.00	-3.65	**0.00**	0.00	0.26	0.00
-487.04	179.20	0.00	-3.65	0.00	**0.00**	0.26	0.00
-487.04	179.20	0.00	-3.65	0.00	**0.00**	0.26	

bolt	M36	As=	8.2	cm2	Ft,Rd =	588.2	kN	γM0= 1.00
class	10.9	fub=	100.0	kN/cm2	Fv,Rd=	488.6	kN	γM1= 1.00
steel	S355	f_u=	49.0	kN/cm2	Fb,Rd=	732.1	kN	γM2= 1.25
grade		fy=	35.5	kN/cm2				γM3= 1.25

BOLTS SCHEMA

[cm]		stiffener	NO		
tf=	3.00			col 1	↓h,yi[cm] M>0	Row No
tw=	1.55				0.0	1
h=	60.0					
b=	30.0					M>0
rc=	2.70				50.1	2
					42.2	3
af=	1.5					
aw=	0.8					
o=	2.00				42.2	3
e=	4.40	≥ 1,2d=4.32			50.1	2	M<0
w1=	28.24	≤ ,30				
w=	12.40	≥1,2			0.0	1
w2=	7.9	≥ 2,2d=,8	29.1	21.2	8.8	0.9	↑h,yi[cm] M<0

plages de la structure

Charger modifications sur Robot | Génération de l'assemblage N° : 1 | Import direct (s'assurer d

l' assemblage	Type	Section poteau	Section poutre	Tiges : diamètre / Boulons : diamètre	Classe	n_v	n_h	e_h (mm) / e_h (mm)	e_v (mm) / h_1 (mm)	Bêche : Section / p_i (mm)	Hauteur (mm)	Longueur tige : / Jarret : h_j (mm)	L_1 (mm) / l_j (mm)	L_2 (mm) / w_j (mm)	L_3 (mm) / t_{wj} (mm)	L_4 (mm) / t_{fj} (mm)	Platine d'about : / h_p (mm)	b_p
1	Jarret boulonné	IPE 500	IPE 300	M24	8,8	3	2	70	52,7	70;70		300	700	150	8	12	600	
2	pied de poteau encastré	IPE 300		M16	4,6	2	2	450	75	IPE 100	100		48	300	96	32	800	
3	pied de poteau articulé	IPE 300		M16	4,6	2	1	150	75	IPE 100	100		48	300	96	32	600	

Enregis. | Charger | standard | Aide | Ignorer autre types | Soudures

Graphique | Paramètres | Général | Jarret | Plats suppl. | Chanfreins | Trous | Boulons | Ouverture arba | Vérification résistance | Analyse

	e	l	h	Repère	Matériau	Nom
Profil jarret					S235JR	JARRET
Ame jarret					S235JR	PLAT
Aile jarret					S235JR	PLAT
Plat fermeture					S235JR	PLAT
Plat compres.aile					S235JR	PLAT
Prolongation jarret					S235JR	PLAT

L4, L3, L2, L1, H1, H2, V, S2, A, S1

Profil

Paramètres du jarret: L1 1200.0 | Défaut

Coupe symétrique pour le jarret de profil

Tolérance (t): 0.00

Cote(s) de sciage : 10.00

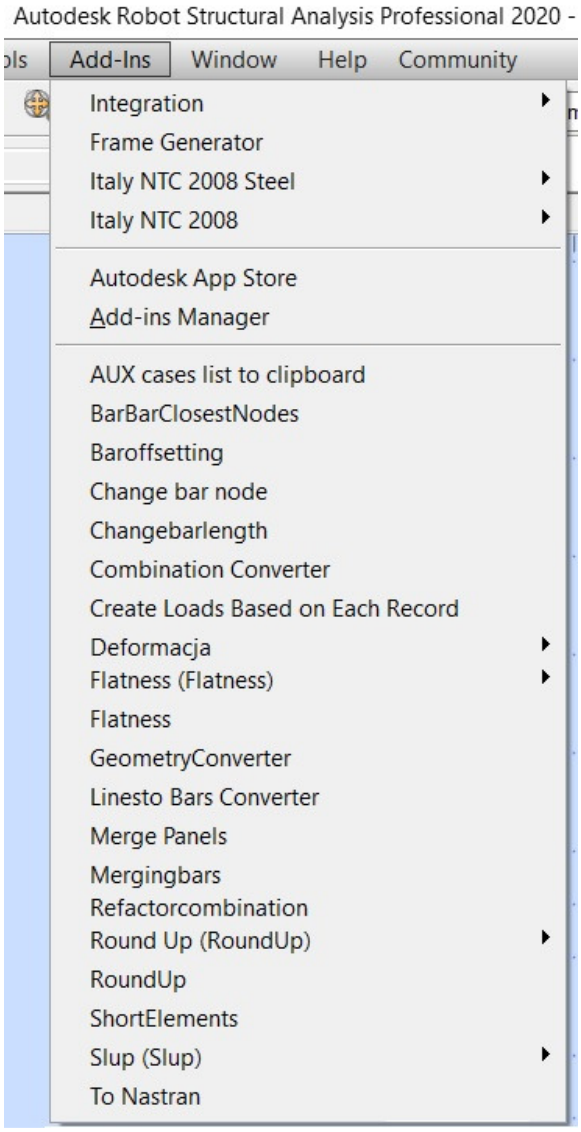
Soudures du plat vertical du jarret:

Coupe à l'extrémité supérieure du jarret (seulement pour profils):

Coupe à l'extrémité inférieure du jarret (seulement pour profils):

d :

Developed addins can be attached to Robot Add-ins menu



Robot Structural Analysis

Robot Forum

http://forums.autodesk.com/t5/Autodesk-Robot-Structural/bd-p/351

API Examples on Forum

http://forums.autodesk.com/t5/Robot-Structural-Analysis/useful-addins-for-Robot-API/td-p/3899448

SDK installation

DVD\x86\Tools\RSASDK

SDK and Examples on computer after installation

C:\Program Files\Autodesk\Autodesk Robot Structural Analysis Professional 2020\SDK\ROBOTSDK.html