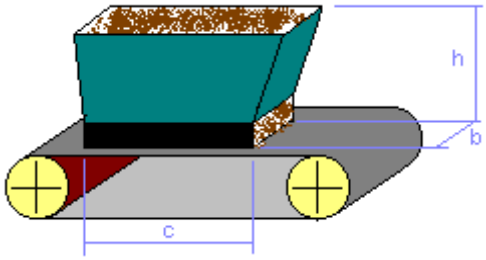
Helix Technologies Pty Ltd

Project	Demo Conveyor High Lift	Client	ABC Iron
Project No.	P9823	Prepared By	Peter Burrow
Conveyor No.	C223	Design Date	14 January 2010

Input Data

Calculation Method		**Bruff's Method**	
Width of Hopper Bottom	b	***0.6***	m
Length of Hopper Bottom	c	***1***	m
Effective Height of Material	h	***1.2***	m
Bulk Density of Material	D	***2400***	kg/m3
Co-efficient of Friction	*u*	***0.5***	
Material "Flow" Factor - Starting	*Ns*	***4***	
Material "Flow" Factor - Running	*Nr*	***1***	
Feeder Belt Speed	V	***1***	m/s



Calculation Results

Pull-out Resistance from Hopper - Starting	Fs	***21.18***	kN
Pull-out Resistance from Hopper - Running	Fr	***5.3***	kN
Pull-out Power Required - Starting	Ps	***21.18***	kW
Pull-out Power Required - Running	Pr	***5.3***	kW

$$F = \frac{2c^2b^2}{c+b} * u \frac{Dg}{1000} * n_s$$

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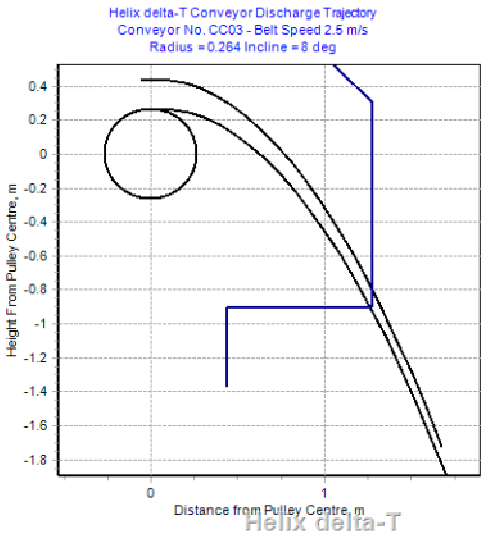
Helix Technologies Pty Ltd

Project	Project	Client	ABC Engineering
Project No.		Prepared By	PCB
Conveyor No.	CC03	Design Date	

Conveyor Discharge Trajectory Report

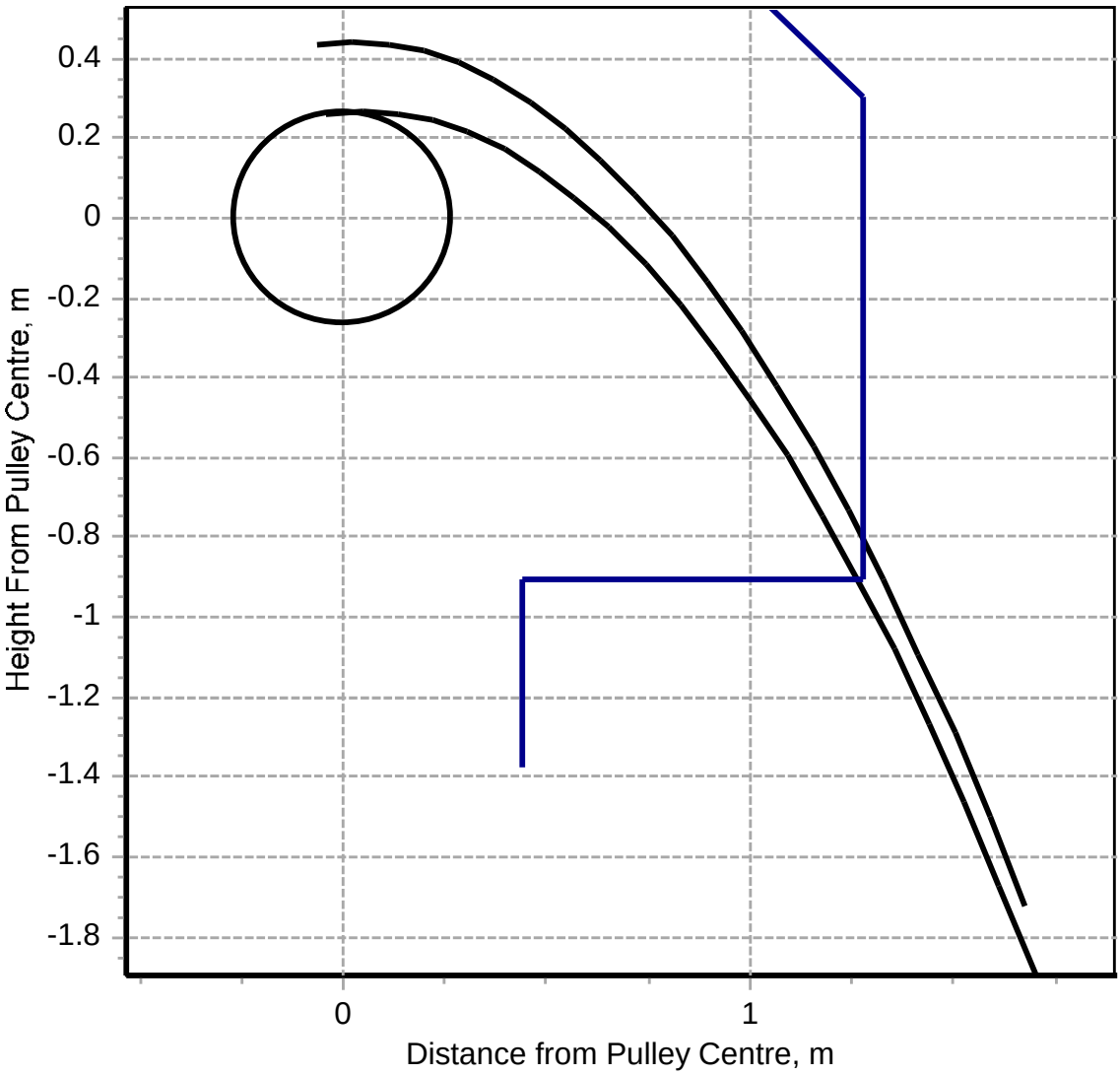


Belt Speed	***2.5***	m/s
Discharge Radius at Belt Line	***0.264***	m
Discharge Radius at Load Line	***0.439***	m
Number of Calc Increments	***20***	
Belt Incline Angle (-Decline)	***8***	deg
Time after Discharge	***0.7***	sec

Co-ordinates Measured from Pulley Centre Line

Time t, seconds	X Distance m	Height H m
0.000	-0.037	0.261
0.035	0.050	0.268
0.070	0.137	0.262
0.105	0.223	0.244
0.140	0.310	0.214
0.175	0.397	0.172
0.210	0.483	0.118
0.245	0.570	0.052
0.280	0.656	-0.026
0.315	0.743	-0.116
0.350	0.830	-0.217
0.385	0.916	-0.331
0.420	1.003	-0.457
0.455	1.090	-0.595
0.490	1.176	-0.745
0.525	1.263	-0.907
0.560	1.350	-1.081
0.595	1.436	-1.267
0.630	1.523	-1.466
0.665	1.610	-1.676
0.700	1.696	-1.898

Helix delta-T Conveyor Discharge Trajectory
Conveyor No. CC03 - Belt Speed 2.5 m/s
Radius = 0.264 Incline = 8 deg



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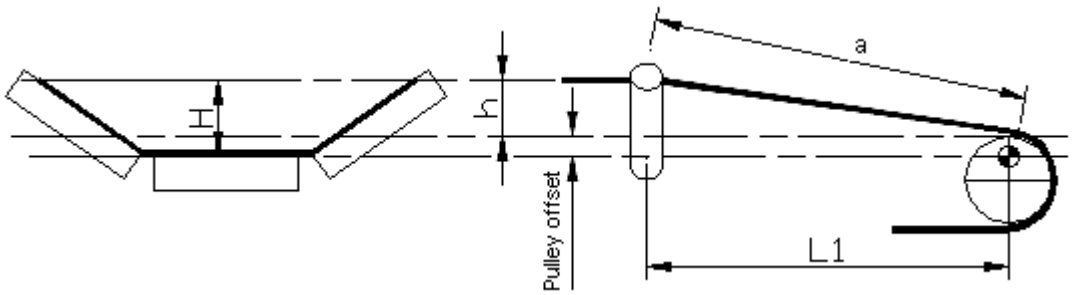

Applies to 3 equal roll idlers

Refer to ISO 5293:2004 Standard

Input Data

Description		***Description or location of transition***	
Idler Trough Angle	lambda	***35***	deg
Belt Width	b	***1600***	mm
Belt Modulus	M	***115200***	kN/m
Transition Depth h (h = H - offset)	h	***168***	mm
Belt Rated Operating Tension	Tr	***239***	kN/m
Belt Tension at Pulley (running)	T1	***100***	kN
Belt Tension at Pulley (starting)	T1s	***150***	kN
Allowable Edge Tension Rise running %	Fr	***5***	% (default = 15% i.e f=1.15)
Allowable Edge Tension Rise starting %	Fs	***67***	% (default = 67% i.e f=1.67)

Calculation Results

$$L_1 = \frac{h}{Sin\lambda}\sqrt{\frac{M}{\Delta T}(1 - Cos\lambda)}$$

Minimum Transition Distance for Edge Tension, running	L1e	2515	mm
Minimum Transition Distance for Edge Tension, starting	L1s	1975	mm
Minimum Transition Distance for Centre Tension > 0	L1c	3087	mm
Required Transition Distance	L1	**3087**	mm

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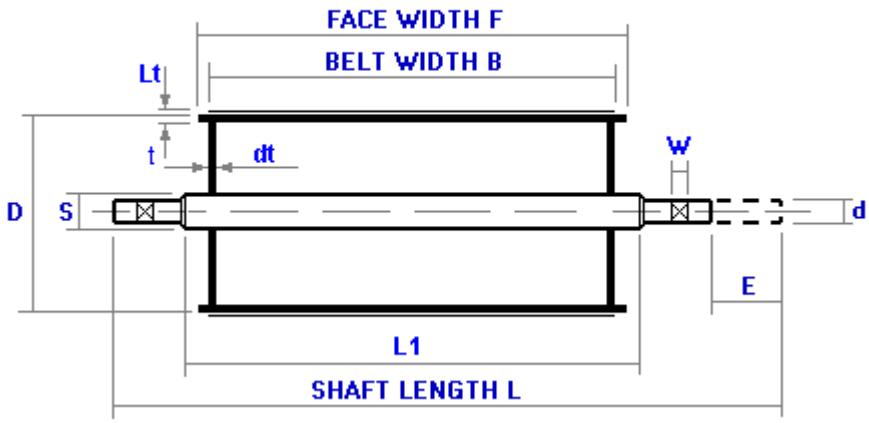

Input Data

Description		***C198 Drive pulley dwg W999-M-057***	
Pulley Face Width	F	***1950***	mm
Pulley Diameter over steel	D	***850***	mm
Steel Shell thickness	t	***25***	mm
Rubber Lagging thickness	Lt	***12***	mm
End Disc thickness	Dt	***90***	mm
Shaft Dimension length L1	L1	***2098***	mm
Overall Shaft length	L	***3934***	mm
Shaft Dia at Hub	S	***320***	mm
Shaft Dia at Bearing	d	***240***	mm

Calculation Results

Shaft Mass		1977	kg
Pulley Shell mass (including lagging)		1774	kg
Total Assembly Inertia J	J	**259.23**	kg-m2

Concave Curve Belt Lift-off Calculation

Helix Technologies Pty Ltd

Project	Demo Conveyor High Lift	Client	ABC Iron
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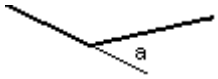
Conveyor No.	C223	Design Date	14 January 2010

Concave Curve Radius - Belt Lift-off

Input Data

Belt Tension at Curve	Tu	***54.63***	kN
Belt Width	W	***1050***	mm
Belt & Material Mass (worn belt condition)	B	***24.9***	kg
Differential Angle	a	***8.53***	deg
Safety Factor	S	***1***	deg

$$R = \frac{SWT_u}{gB}$$



Calculation Results

Minimum Curve Radius	R	**223.72**	m
Length of Curve	X	**33.18**	m

$$X = RSina$$

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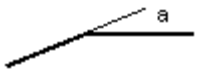
Convex Curve Radius - Edge Tension Rise

Input Data

Belt Tension at Curve	Tu	***54.63***	kN
Belt Width	W	***1050***	mm
Belt Modulus	E	***57600***	kN/m
Differential Angle	a	***8.53***	deg
Idler Trough Angle	Ta	***35***	deg
Belt Rated Working Tension	Tr	***119***	kN/m
Permissable Edge Tension Rise %	m	***15***	%

$$R = \frac{nEW}{1000(mT_r - T_u)}$$



Calculation Results

Minimum Curve Radius	R	**90.79**	m
Length of Curve	X	**13.47**	m

$$X = RSina$$

Helix Technologies Pty Ltd

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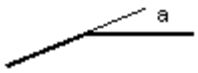
Conveyor No.	C223	Design Date	14 January 2010

Convex Curve Radius - Centre Buckling

Input Data

Belt Tension at Curve	Tu	***54.63***	kN
Belt Width	W	***1050***	mm
Belt Modulus	E	***57600***	kN/m
Differential Angle	a	***8.53***	deg
Idler Trough Angle	Ta	***35***	deg
Belt Rated Working Tension	Tr	***119***	kN/m
Minimum Centre Tension %	Tmin%	***5***	%

$$R = \frac{nEW}{2000(T_u - mT_r)}$$



Calculation Results

Minimum Curve Radius	R	**83.57**	m
Length of Curve	X	**12.4**	m

$$X = RSina$$

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Pulley Speed Calculation

Input Data

Pulley Number		***99***	
Pulley Description		***Pulley Drive Factor check***	
Pulley / Drum Diameter	D	***0.05***	m
Belt Speed	V	***0.2***	m/s

$$N = \frac{60 \times V}{\pi \times D}$$

Calculation Results

Minimum Curve Radius	N	**76.39**	rpm

Helix Technologies Pty Ltd

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Conveyor No.	C223	Design Date	14 January 2010

Pulley Drive Factor Calculation

Input Data

Pulley Number		***99***	
Pulley Description		***Pulley Drive Factor check***	
Tight Side Pulley Tension	*T1*	***100***	kN
Slack Side Pulley Tension	*T2*	***50***	kN
Co-efficient of Friction	*u*	***0.3***	
Wrap Angle (theta)		***210***	deg

$$T_e = T_1 - T_2$$

$$\frac{T_1}{T_2} = e^{\mu\theta}$$

$$Cw = \frac{T_2}{Te} = \frac{1}{e^{ua} - 1}$$

Calculation Results

Drive Factor	Cw	**0.499**	
Minimum Required T2 Tension	*T2*	***25***	kN
Minimum Required Wrap Angle	*Wrap*	***132.4***	deg

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Bearing L10h Life Calculation

Input Data

Pulley Number		***99***	
Description		***Pulley Drive Factor check***	
Radial Load on Bearing	P	***1080.5***	N
Bearing Dynamic Load Rating	C	***14000***	N
Bearing Rotating Speed	N	***565***	rpm
Bearing Type		**Ball**	

$$L10h = \frac{\left(\frac{C}{P}\right)^{p} \times 10^{6}}{60 \times N}$$

Calculation Results

Calculated L10h Bearing Life		**64167**	hours

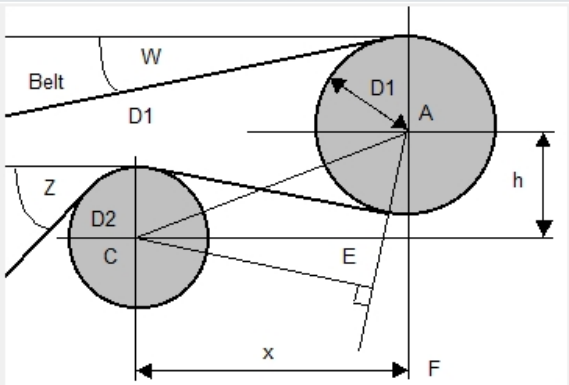
Helix delta-T Conveyor Design Program - Calculate Pulley Wrap Angle

Help Exit

Calculation Input Details

Drive Pulley Dia D1	1.2	m
Snub Pulley Dia D2	0.9	m
Height Difference h	1	m
Pulley Horizontal Centres X	1	m
Belt Approach Angle on Drive W	0	deg
Belt Departure Angle on Snub Z	8.53	deg
Co-efficient of Friction u	0.25	

Calculate Wrap



Calculated Values

Length of Line AC	1.207	m
Length of Line AE	1.053	m
Angle CAF	61.397	deg
Angle CAE	29.289	deg
Angle FAE	32.108	deg
Wrap Angle on Drive Pulley	218.108	deg
Wrap Angle on Snub Pulley	38.108	deg

Transfer Wrap Angle to current drive

OK