

COMPANY NAME: Professional Designers & Engineers, Inc.
 PROJECT NAME: PRO-BELT EXAMPLE
 DESIGNED BY: Kent R. Rieske
 DATE: January 24, 2009
 CONVEYOR NO.: EXAMPLE HEAD DRIVE
 PRODUCT: TYPICAL
 LOAD CASE NUMBER: 1 - File Name: EXPHEAD1.HED

BELT WIDTH, inches	=	60	HORIZONTAL LENGTH, ft	=	1698.10
CONVEYOR CAPACITY, tph	=	2400	VERTICAL LIFT, ft	=	265.10
BULK DENSITY, lb/cu ft	=	50	ANGLE OF INCLINE, deg.	=	16.00
MAX. LUMP SIZE, inches	=	3	MIN. TEMPERATURE, F	=	-40
MAX. BELT LOADING, %	=	83	TEMPERATURE FACTOR, Kt	=	3.00
IDLER TROUGHING, deg.	=	35	IDLER ROLL SIZE, inch	=	6
NUMBER ROLLERS/IDLER	=	3	IDLER CEMA LOAD RATING	=	D
ANGLE OF REPOSE, deg.	=	35	TROUGH IDLER SPACE, ft	=	4.00
SURCHARGE ANGLE, deg.	=	25	FULL BELT AREA, sq ft	=	3.107
FULL BELT AREA, sq ft	=	3.107	RETURN IDLER SPACE, ft	=	10.00
MAXIMUM BELT SAG, %	=	2.0	RETURN ROLLERS/IDLER,	=	1
MIN. BELT SPEED, fpm	=	620	IDLER FRICTION, Ai	=	1.50
ACTUAL BELT SPEED, fpm	=	620	IDLER FRICTION, Kx	=	0.481
EST. FABRIC BELT, lb/ft	=	18.0	ROLLERS FACTOR, Kr	=	1.00
EST. STEEL BELT, lb/ft	=	27.0	Kx MULTIPLIER	=	1.00
ACTUAL BELT WT, lb/ft	=	27.0	ACTUAL IDLER LOAD, lbs	=	624.1
MATERIAL WEIGHT, lb/ft	=	129.0	IDLER SERVICE FACTORS	=	1.15
BELT EDGE DISTANCE, in	=	6.15	IDLER LOAD W/S.F., lbs	=	717.4
ENVIRONMENTAL FACTOR			MFG. IDLER RATING, lbs	=	1070
1 = clean			RETURN IDLER LOAD, lbs	=	270
2 = moderate			DRIVE EFFICIENCY, %	=	94
3 = dirty	=	2	NO. OF DRIVE PULLEYS		
MAINTENANCE FACTOR			(single = 1, dual = 2)	=	1
1 = good			DRIVE WRAP FACTOR, Cw	=	0.38
2 = fair			Ky MULTIPLIER	=	1.00
3 = poor	=	2	User Selected Take-up or		
DAILY OPERATION, hours	=	16	Counterweight Location	=	2
			C1 REDUCED FRICTION	=	1.00

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TAKE-UP or COUNTERWEIGHT DATA

Minimum Required Take-up or Counterweight, lbs = 25927
 User Selected Take-up or Counterweight, lbs = 30000
 Stopping Take-up Tension Test Page 7 = OK
 15.00 Tons

MOTOR HORSEPOWER RESULTS

Conveyor Brake Horsepower at the Drive Pulley = 886.5
 Drive Losses Based on Efficiency Listed on Page 1 = 56.4

 Recommended Minimum Motor Horsepower = 942.9
 Actual Motor Horsepower and Run/Accel Test Page 7 = 1000.0 OK
 OK

EFFECTIVE BELT TENSION RESULTS

Effective Conveyor Belt Tension, Te, lbs = 47006
 Drive Pulley(s) Tension, lbs = 180

 Total Effective Conveyor Drive Tension, lbs = 47186

PRIMARY BELT TENSION RESULTS

Belt Tension at Drive Pulley, T2, lbs = 19899
 Belt Tension at Drive Pulley, T1, lbs = 66905
 Minimum Allowable Belt Tension, To, lbs = 3901
 Belt Tension at Tail Pulley, Tt, lbs = 15910

 Conveyor Belt Unit Stress @ T1, PIW, lbs/in width = 1115
 Conveyor Belt Unit Stress @ T2, PIW, lbs/in width = 332
 Max. Conveyor Belt Unit Stress, PIW, lbs/in width = 1115

TOTAL BELT TENSION AT SECTION POINTS

TROUGHING POINT NO.	BELT TENSION lbs.	TROUGHING POINT NO.	BELT TENSION lbs.	RETURN POINT NO.	BELT TENSION lbs.	RETURN POINT NO.	BELT TENSION lbs.
1	15910	14	65944	25	0	12	0
2	15943	15	66424	24	0	11	0
3	17497	16	66905	23	0	10	0
4	18244	17	0	22	0	9	0
5	28825	18	0	21	0	8	0
6	33606	19	0	20	0	7	0
7	38386	20	0	19	0	6	0
8	43167	21	0	18	0	5	19899
9	47947	22	0	17	0	4	20663
10	52728	23	0	16	0	3	14988
11	57509	24	0	15	0	2	15000
12	62289	25	0	14	0	1	15910
13	65464			13	0		

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SECTION BETWEEN POINTS	Ky	L*Kx*Kt	C1*		MAT'L ACC., SKIRTBOARDS		TOTAL lbs.
			L*Ky* WB*Kt	C1* L*Ky*WM	PULLEYS & MISC.*C1	H* (WM+WB)	
1-2	0.0161	17	16	0	0	0	33
2-3	0.0160	173	156	124	0	1101	1554
3-4	0.0160	115	104	165	0	362	746
4-5	0.0160	577	518	826	8660	0	10581
5-6	0.0160	144	130	206	4300	0	4781
6-7	0.0160	144	130	206	4300	0	4781
7-8	0.0160	144	130	206	4300	0	4781
8-9	0.0160	144	130	206	4300	0	4781
9-10	0.0160	144	130	206	4300	0	4781
10-11	0.0160	144	130	206	4300	0	4781
11-12	0.0160	144	130	206	4300	0	4781
12-13	0.0160	173	156	248	2598	0	3174
13-14	0.0160	144	130	206	0	0	480
14-15	0.0160	144	130	206	0	0	480
15-16	0.0160	144	130	206	0	0	480
16-17	0.0000	0	0	0	0	0	0
17-18	0.0000	0	0	0	0	0	0
18-19	0.0000	0	0	0	0	0	0
19-20	0.0000	0	0	0	0	0	0
20-21	0.0000	0	0	0	0	0	0
21-22	0.0000	0	0	0	0	0	0
22-23	0.0000	0	0	0	0	0	0
23-24	0.0000	0	0	0	0	0	0
24-25	0.0000	0	0	0	0	0	0
TOTALS		2500	2245	3427	41359	1463	50994

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SECTION BETWEEN POINTS	C1* L*0.015* WB*Kt*R	H*WB	C1* PULLEYS	C1* BELT SCRAPER	C1* V-PLOW	MISC. TENSION *C1 lbs.	TOTAL lbs.
25-24	0	0	0	0	0	0	0
24-23	0	0	0	0	0	0	0
23-22	0	0	0	0	0	0	0
22-21	0	0	0	0	0	0	0
21-20	0	0	0	0	0	0	0
20-19	0	0	0	0	0	0	0
19-18	0	0	0	0	0	0	0
18-17	0	0	0	0	0	0	0
17-16	0	0	0	0	0	0	0
16-15	0	0	0	0	0	0	0
15-14	0	0	0	0	0	0	0
14-13	0	0	0	0	0	0	0
13-12	0	0	0	0	0	0	0
12-11	0	0	0	0	0	0	0
11-10	0	0	0	0	0	0	0
10-9	0	0	0	0	0	0	0
9-8	0	0	0	0	0	0	0
8-7	0	0	0	0	0	0	0
7-6	0	0	0	0	0	0	0
6-5	0	0	0	0	0	0	0
5-4	365	0	100	300	0	0	765
4-3	1482	-7158	0	0	0	0	-5675
3-2	272	-540	100	0	180	0	12
2-1	30	540	340	0	0	0	910
TOTALS	2149	-7158	540	300	180	0	-3988

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SECTION BETWEEN POINTS	PERCENT FULL LOAD (decimal)	LENGTH "L" ft	LIFT "H" ft	SKIRT-BOARD LENGTH,ft	NUMBER of Tripper & Head	PULLEYS Snub & Bend	MISC. TENSION lbs.
1-2	0.00	12.00	0.00	0.00	0	0	0
2-3	0.50	120.00	0.00	120.00	0	0	0
3-4	1.00	80.00	0.00	20.00	0	0	0
4-5	1.00	400.00	55.50	0.00	0	0	0
5-6	1.00	100.00	27.56	0.00	0	0	0
6-7	1.00	100.00	27.56	0.00	0	0	0
7-8	1.00	100.00	27.56	0.00	0	0	0
8-9	1.00	100.00	27.56	0.00	0	0	0
9-10	1.00	100.00	27.56	0.00	0	0	0
10-11	1.00	100.00	27.56	0.00	0	0	0
11-12	1.00	100.00	27.56	0.00	0	0	0
12-13	1.00	120.00	16.65	0.00	0	0	0
13-14	1.00	100.00	0.00	0.00	0	0	0
14-15	1.00	100.00	0.00	0.00	0	0	0
15-16	1.00	100.00	0.00	0.00	0	0	0
16-17	0.00	0.00	0.00	0.00	0	0	0
17-18	0.00	0.00	0.00	0.00	0	0	0
18-19	0.00	0.00	0.00	0.00	0	0	0
19-20	0.00	0.00	0.00	0.00	0	0	0
20-21	0.00	0.00	0.00	0.00	0	0	0
21-22	0.00	0.00	0.00	0.00	0	0	0
22-23	0.00	0.00	0.00	0.00	0	0	0
23-24	0.00	0.00	0.00	0.00	0	0	0
24-25	0.00	0.00	0.00	0.00	0	0	0
TOTALS		1732.0	265.1	140.00	0	0	0

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SECTION BETWEEN POINTS	LENGTH "L" ft	LIFT "H" ft	NUMBER of PULLEYS		BELT SCRAPER	V-PLOW	MISC. TENSION lbs.
			Snub & Bend	Take-up & Tail			
25-24	0.00	0.00	0	0	0	0	0
24-23	0.00	0.00	0	0	0	0	0
23-22	0.00	0.00	0	0	0	0	0
22-21	0.00	0.00	0	0	0	0	0
21-20	0.00	0.00	0	0	0	0	0
20-19	0.00	0.00	0	0	0	0	0
19-18	0.00	0.00	0	0	0	0	0
18-17	0.00	0.00	0	0	0	0	0
17-16	0.00	0.00	0	0	0	0	0
16-15	0.00	0.00	0	0	0	0	0
15-14	0.00	0.00	0	0	0	0	0
14-13	0.00	0.00	0	0	0	0	0
13-12	0.00	0.00	0	0	0	0	0
12-11	0.00	0.00	0	0	0	0	0
11-10	0.00	0.00	0	0	0	0	0
10-9	0.00	0.00	0	0	0	0	0
9-8	0.00	0.00	0	0	0	0	0
8-7	0.00	0.00	0	0	0	0	0
7-6	0.00	0.00	0	0	0	0	0
6-5	0.00	0.00	0	0	0	0	0
5-4	300.00	0.00	1	0	1	0	0
4-3	1220.00	-265.10	0	0	0	0	0
3-2	224.00	-20.00	1	0	0	1	0
2-1	25.00	20.00	1	2	0	0	0
TOTALS	1769.0	-265.1	3	2	1	1	0

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CONVEYOR ACCELERATION:

ACTUAL DRIVE SIZE, hp = 1000
 ELECTRIC FREQUENCY, Hz = 60
 MOTOR SPEED, rpm = 1750
 LOCKED ROTOR TORQUE, % = 135
 PULL-UP TORQUE, % = 125
 BREAKDOWN TORQUE, % = 150
 AVE. STARTING TORQUE, % = 140
 (for time calculations)
 RUNNING HORSEPOWER TEST = OK
 STARTING TORQUE TEST = OK
 (125% running load)
 ACCELERATION TIME, sec = 8.2

CONVEYOR STOPPING:

COASTING TIME, seconds = 4.0
 (without brake)
 TAIL BRAKE RATING, lbs = 0
 (effective belt tension)
 COASTING TIME, seconds = 4.0
 (with brake)
 COASTING DISTANCE, ft = 20.62
 MATERIAL DISCHARGED
 DURING COASTING, tons = 1.33
 VOLUME DISCHARGED
 DURING COASTING, cu ft = 53.21
 STOP TAIL TENSION, lbs = 15730
 STOP MIN. TROUGHING = 15720
 STOPPING TENSION TEST = OK
 BACKSTOP REQUIRED = YES
 BACKSTOP LOAD, lbs = 31339
 (Belt pull inclines loaded)

BELT STRESS DATA:

MAX. BELT STRESS, PIW = 1347
 MIN. BELT RATING, PIW = 1115
 ACTUAL RATING, PIW = 1800
 (> min. or > max/150%)

DRIVE INERTIA WK², lb-ft²

MOTOR WK², lb-ft² = 692
 REDUCER WK², lb-ft² = 138
 COUPLINGS WK², = 28
 OTHER (+ or -) WK², = 0
 TOTAL EQUIPMENT WK² = 858

ACCELERATION EQUIVALENT WEIGHT:

DRIVE EQUIV. WT., lbs = 269732
 DRIVE PULLEY(s), lbs = 1573
 WEIGHT OF PULLEYS, lbs = 2333
 WEIGHT OF BELT, lbs = 94527
 TROUGHING IDLERS, lbs = 29617
 RETURN IDLERS, lbs = 12100
 OTHER (+ or -) WT, lbs = 0
 TOTAL CONVEYOR WT, lbs = 409882
 MATERIAL LOAD, lbs = 214194
 TOTAL LOAD, lbs = 624076
 ACCEL. Te TENSION, lbs = 24330
 (Average above running)
 KINETIC ENERGY, ft lbs = 1034743
 FRICTION & GRAVITY
 FORCES, lbs = 50187

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<----- TROUGHING BELT -----><----- RETURN BELT ----->

TROUGHING POINT NO.	Run lbs.	Accel lbs.	Stop lbs.	RETURN POINT NO.	Run lbs.	Accel lbs.	Stop lbs.
1	15910	16017	15730	25	0	0	0
2	15943	16075	15720	24	0	0	0
3	17497	18249	16226	23	0	0	0
4	18244	19653	15858	22	0	0	0
5	28825	33525	20871	21	0	0	0
6	33606	39128	24259	20	0	0	0
7	38386	44731	27647	19	0	0	0
8	43167	50334	31036	18	0	0	0
9	47947	55938	34424	17	0	0	0
10	52728	61541	37812	16	0	0	0
11	57509	67144	41201	15	0	0	0
12	62289	72747	44589	14	0	0	0
13	65464	76909	46093	13	0	0	0
14	65944	78212	45181	12	0	0	0
15	66424	79515	44269	11	0	0	0
16	66905	80818	43357	10	0	0	0
17	0	0	0	9	0	0	0
18	0	0	0	8	0	0	0
19	0	0	0	7	0	0	0
20	0	0	0	6	0	0	0
21	0	0	0	5	19899	17050	24720
22	0	0	0	4	20663	18319	24630
23	0	0	0	3	14988	14606	15635
24	0	0	0	2	15000	15000	15000
25	0	0	0	1	15910	16017	15730

CONVEYOR NUMBER = EXAMPLE HEAD DRIVE
LOAD CASE NUMBER = 1 - File Name: EXPHEAD1.HED

CONCAVE VERTICAL CURVE:

CONVEX VERTICAL CURVE:

POINT NO. BEFORE CURVE = 4
ACCELERATION TENSION @ POINT BEFORE CURVE, lb = 19653
TOTAL CURVE ANGLE, deg = 16
IDLER SPACING, inch = 48
NUMBER OF IDLER SPACES = 100
(in curve section)
MINIMUM CONCAVE CURVE RADIUS, ft
Based on idler layout = 1432.4
Based on belt lift = 807.9
Total modulus, lb/inch. = 480000
Belt modulus of elasticity, lb/in/ply times number of plies.
Fabric belt stress = 102.0
Fabric belt buckling = 1113.9
Steel cable stress = 102.0
Steel cable buckling = 445.6
Min. FABRIC BELT radius = 1432.4
Min. STEEL CABLE radius = 1432.4

POINT NUMBER @ CURVE = 13
(highest tension point)
TENSION @ CURVE, lbs = 65464
TOTAL CURVE ANGLE, deg = 16
IDLER SPACING, inch = 48
NUMBER OF IDLER SPACES = 30
(in curve section)
IDLER CEMA @ CURVE = E
IDLER ROLL SIZE, inch = 6
IDLER LOAD, lbs = 1233
IDLER LOAD W/S.F., lbs = 1418
MFG. LOAD RATING, lbs = 1800
MINIMUM CONVEX CURVE RADIUS, ft
Based on idler layout = 429.7
Fabric belt stress = 430.6
Fabric belt buckling = 143.9
Steel belt stress = 430.6
Steel belt buckling = 143.9

NOTE: The actual concave radius is the largest for any load case. Check with all sections loaded before the curve and empty after. Check with all sections empty before the curve and full after for downhill regeneration. Check the lowest tension load case for buckling. Check motor inertia on Page 8 against actual.

Min. FABRIC BELT radius = 430.6
Min. STEEL CABLE radius = 430.6

The maximum convex vertical curve idler loads occur at maximum belt tension. Check load cases with sections empty and fully loaded. Check lowest tension load case for buckling radius.

Idler Vertical Misalignment Load Check

Location Point No.	CEMA Load Rating	Roll Diameter Inches	Vertical Misalignment Inches	Idler Spacing Inches	Load W/S.F. lbs.	Idler Load Test
3	D	6	0	48	717.4	OK