

2020 FIRST Robotics Competition

Bill of Materials

Team Name: Triple Helix
 Event: 2020 FIRST Chesapeake District - Haymarket VA event

Team #: 2363
 City: Newport News

Date: 2/28/2019
 State: VA

Major Subsystem Names Here	Component Type	Describe the Part (Axle, Bearing, Lifter, Solenoid)	What is it made from	Where did you buy it (Home Depot, AndyMark, Supply House, Etc.)	Actually used	KOP quantity	BOM quantity	Piece, Inch, Etc.	Cost Per Unit (\$)	Total Price	Notes
Subsystem	Type	Description	Material	Source	Part #	Qty Used	Qty KOP	Qty BOM	Unit Price	Total Price	Notes
General materials	Aluminum stock	Drive rails, telescope upright	Tube 2x1-1/2x1/8" 6061-T6	OnlineMetals	-	6.8	0.0	7.0	FT	\$ 6.65	\$ 46.52
General materials	Aluminum stock	Intake pivot uprights	Tube 2x1x1/8" 6061-T6	OnlineMetals	-	0.7	0.0	1.0	FT	\$ 5.37	\$ 5.37
General materials	Aluminum stock	Intake pivot reinforcements	Tube 2x1x1/8" 6061-T6	OnlineMetals	-	0.7	0.0	1.0	FT	\$ 9.07	\$ 9.07
General materials	Aluminum stock	Ladder bars, intake torsion bar	Tube 2x1x1/16" 6061-T6	OnlineMetals	-	0.4	0.0	7.0	FT	\$ 2.61	\$ 18.28
General materials	Aluminum stock	Shooter tube axle	Tube 1" OD x 0.065" wall 6061-T6	OnlineMetals	-	0.4	0.0	1.0	FT	\$ 7.43	\$ 7.43
General materials	Aluminum stock	Bumper corner angle	Angle 1-1/2x1-1/2x1/8" 6061-T6	OnlineMetals	-	2.0	0.0	3.0	FT	\$ 3.01	\$ 9.04
General materials	Aluminum stock	Bumper latch bracket	Angle 1x1x1/8" 6061-T6	OnlineMetals	-	1.5	0.0	2.0	FT	\$ 1.81	\$ -
General materials	Aluminum stock	Telescope upright support angle	Angle 1x1x1/16" 6061-T6	McMaster-Carr	8982K39	1.6	0.0	2.0	FT	\$ 1.64	\$ -
General materials	Aluminum stock	Battery shoe	Angle 3/4x3/4x1/16" 6061-T6	McMaster-Carr	8982K56	0.5	0.0	1.0	FT	\$ 1.56	\$ -
General materials	Aluminum stock	Intake cylinder pivot plates	Angle 1/2x1/2x1/16" 6061-T6	McMaster-Carr	8982K54	0.2	0.0	1.0	FT	\$ 1.04	\$ -
General materials	Aluminum stock	Hex shaft 1/2"	7075-T6	VexPro	217-2753	2.4	0.0	3.0	FT	\$ 5.00	\$ 14.99
General materials	Aluminum stock	Thunderhex shaft 1/2"	7075-T6	VexPro	217-4017	4.3	0.0	6.0	FT	\$ 5.33	\$ 31.98
General materials	Plastic stock	Bellypan	Polycarbonate, 1/8", perforated	AndyMark	am-0836	1	0	1	EA	\$ 69.00	\$ 69.00
General materials	Plastic stock	Gearbox	Acetal copolymer 1/4"	McMaster-Carr	8492K233	1.4	0.0	2.0	SQ FT	\$ 23.73	\$ 47.45
General materials	Plastic stock	Magazine sides, bumper backer plates, intake	Polycarbonate 1/4"	ePlastics	-	14.6	0.0	24.0	SQ FT	\$ 8.91	\$ 213.78
General materials	Plastic stock	Wing walls, serializer ramps, magazine	Polycarbonate 1/8"	ePlastics	-	11.1	0.0	8.0	SQ FT	\$ 4.92	\$ 39.35
General materials	Plastic stock	Intake lacerate, RSL mount, vent valve	Polycarbonate 1/16"	McMaster-Carr	8574K24	0.1	0.0	7.7	SQ FT	\$ 4.92	\$ -
General materials	Plastic stock	Intake roller	Tube 1-1/2 OD x 1-1/4 ID PC	McMaster-Carr	8585K206	5.7	0.0	8.0	FT	\$ 4.12	\$ 32.96
General materials	Plastic stock	Magazine rollers, sorter roller	Tube 1-1/4 OD x 1-1/8 ID PC	Amazon	-	3.1	0.0	4.0	FT	\$ 3.66	\$ 14.65
General materials	Plastic stock	Intake roller hubs, shooter-climber hubs	PLA Plus	Amazon	-	2.0	0.0	2.0	KG	\$ 19.99	\$ 39.98
General materials	Plastic stock	Telescope outer tube	Square tube 3/8" PVC	McMaster-Carr	85095K76	2.4	0.0	5.0	FT	\$ 5.17	\$ 25.85
General materials	Plastic stock	Telescope inner tube	Square tube 3/4" PVC	McMaster-Carr	85095K67	2.2	0.0	5.0	FT	\$ 2.32	\$ 11.59
General materials	Miscellaneous	Phys 23/32"	Plywood	Lowes	-	9.1	0.0	16.0	SQ FT	\$ 1.41	\$ 22.48
General materials	Miscellaneous	Pool noodle	Closed-cell polyethylene foam	AndyMark	am-0837	2.7	0.0	7.7	FT	\$ 1.41	\$ -
General materials	Miscellaneous	Webbing 1 wide	Nylon	Amazon	-	0.5	0.0	10.0	YD	\$ 1.17	\$ 11.67
General materials	Miscellaneous	Climber one way bearing inner races	Tube 1 OD x 1/2 ID 4130 steel	McMaster-Carr	89955K801	0.1	0.0	1.0	FT	\$ 25.35	\$ 25.35
General materials	Power transmission	Chain #25	Steel	Diamond Chain Company	X-1189-010	8.8	0.0	10.0	FT	\$ 13.99	\$ 139.90
General materials	Power transmission	Chain 25H	Steel	VexPro	217-2775	0.8	0.0	20.0	FT	\$ 1.20	\$ 23.98
General materials	Power transmission	Flat belting 3/32 thk x 1 wide	Polyurethane	McMaster-Carr	6075K15	5.2	0.0	6.0	FT	\$ 4.08	\$ 24.48
Drivetrain	Electronic	Talon SRX	-	VexPro	217-8080	2	2	0	EA	\$ 89.99	\$ -
Drivetrain	Electronic	Victor SPX	-	VexPro	217-3219	4	4	0	EA	\$ 49.91	\$ -
Drivetrain	Electronic	Talon SRX Universal Breakout	-	AndyMark	am-3281	2	4	0	EA	\$ 15.00	\$ 30.00
Drivetrain	Motor	Mini CIM	-	VexPro	217-3371	6	1	6	EA	\$ 29.99	\$ 179.94
Drivetrain	Sensor	Optical encoder	-	US Digital	S4T-100-250-S-B	2	0	2	EA	\$ 70.80	\$ 141.60
Drivetrain	Wheel	Pneumatic wheel hub	Aluminum	WestCoast Products	WCP-0049	6	0	6	EA	\$ 29.99	\$ 179.94
Drivetrain	Wheel	Pneumatic tire, 6 OD, centipede tread	Rubber	WestCoast Products	WCP-0047	2	0	2	EA	\$ 14.99	\$ 29.98
Drivetrain	Wheel	Pneumatic tire, 6 OD, street tread	Rubber	ElectricScooterParts.com	TIR-6X1-25P	4	0	4	EA	\$ 14.95	\$ 59.80
Drivetrain	Wheel	Intake tube for tire	Rubber	ElectricScooterParts.com	TUB-6X1-25	4	0	4	EA	\$ 14.95	\$ 59.80
Drivetrain	Power transmission	VersaBlock	6061-T6	VexPro	217-5852	4	0	4	EA	\$ 24.99	\$ 99.96
Drivetrain	Power transmission	WCP Cam	Sintered steel	VexPro	217-3431	4	0	4	EA	\$ 4.99	\$ -
Drivetrain	Power transmission	Sprocket 16T #25 1/2 hex bore	7075-T6	VexPro	217-5833	8	0	8	EA	\$ 12.99	\$ 103.92
Drivetrain	Power transmission	Pinion 20DP 12T 8mm keyed bore	Steel	VexPro	217-3099	6	0	6	EA	\$ 9.99	\$ 59.94
Drivetrain	Power transmission	Gear 20DP 72T 1/2 hex bore	7075-T6	VexPro	217-3576	2	0	2	EA	\$ 24.99	\$ 49.98
Drivetrain	Power transmission	Gear 20DP 28T 1/2 hex bore	Steel	VexPro	217-5468	2	0	2	EA	\$ 11.99	\$ 23.98
Drivetrain	Power transmission	Gear 20DP 56T 1/2 hex bore	7075-T6	VexPro	217-5474	2	0	2	EA	\$ 19.99	\$ 39.98
Drivetrain	Power transmission	Clamping shaft collar 1/2" thin	6061-T6	VexPro	217-2737	2	0	2	EA	\$ 4.99	\$ -
Drivetrain	Power transmission	Bearing 1/2 hex ID x 1-1/8 OD	-	VexPro	217-3875	8	0	8	EA	\$ 4.99	\$ -
Drivetrain	Power transmission	Flanged bearing 13.75mm ID x 1-1/8 OD	-	VexPro	217-4006	4	0	4	EA	\$ 4.99	\$ -
Drivetrain	Power transmission	Radial bearing 13.75mm ID x 1-1/8 OD	-	VexPro	217-4270	2	0	2	EA	\$ 4.99	\$ -
Drivetrain	Miscellaneous	VersaFrame T Gusset	5052	VexPro	217-3547	8	0	8	EA	\$ 3.50	\$ -
Bumper	Miscellaneous	Snap slide latch	-	Pegasus Auto Racing	3009	8	0	8	EA	\$ 2.77	\$ -
Bumper	Miscellaneous	Bumper fabric	-	Robopro	RP-2001.5	2	0	2	EA	\$ 16.00	\$ -
Bumper	Miscellaneous	Bumper numbers	-	Rev Robotics	REV-2014	8	0	8	EA	\$ 10.00	\$ 80.00
Intake	Electronic	Talon SRX	-	VexPro	217-8080	1	0	1	EA	\$ 89.99	\$ 89.99
Intake	Motor	775pro	-	VexPro	217-4347	1	1	0	EA	\$ 19.99	\$ -
Intake	Power transmission	VersaPlanetary v2 base kit, 1/2" hex out	-	VexPro	217-4973	1	0	1	EA	\$ 39.99	\$ 39.99
Intake	Power transmission	VersaPlanetary ring gear	-	VexPro	217-2816	2	0	2	EA	\$ 9.99	\$ 19.98
Intake	Power transmission	VersaPlanetary 4:1 gear stage	-	VexPro	217-2818	2	0	2	EA	\$ 14.99	\$ 29.98
Intake	Power transmission	Flanged bearing 3/8 ID x 1-1/8 OD	-	AndyMark	am-0573	2	0	2	EA	\$ 3.00	\$ -
Intake	Power transmission	Flanged bearing 1/2 hex ID x 1-1/8 OD	-	VexPro	217-3875	6	0	6	EA	\$ 4.99	\$ -
Intake	Power transmission	Pulley HTD 24T 9mm width 1/2" hex bore	Polycarbonate	AndyMark	am-3403	6	0	6	EA	\$ 9.00	\$ 54.00
Intake	Power transmission	Belt HTD 5mm pitch, 9mm width, 70 teeth	Neoprene, fiberglass	V-Belt Guys	350-5M-09	2	0	2	EA	\$ 2.14	\$ -
Intake	Power transmission	Belt HTD 5mm pitch, 9mm width, 56 teeth	Neoprene, fiberglass	V-Belt Guys	280-5M-09	2	0	2	EA	\$ 1.84	\$ -
Intake	Miscellaneous	Shoulder screw, 3/8 shoulder dia, 1-3/8"	Alloy steel	McMaster-Carr	91259A483	2	0	2	EA	\$ 4.58	\$ -
Intake	Pneumatic	Cylinder, round body, 3/4" bore x 7" stroke	-	Bimba	047-DP	2	0	2	EA	\$ 40.35	\$ 80.70
Sorter	Electronic	Talon SRX	-	VexPro	217-8080	1	0	1	EA	\$ 89.99	\$ 89.99
Sorter	Motor	775pro	-	VexPro	217-4347	1	0	1	EA	\$ 19.99	\$ 19.99
Sorter	Power transmission	VersaPlanetary v2 base kit, 1/2" hex out	-	VexPro	217-4973	1	0	1	EA	\$ 39.99	\$ 39.99
Sorter	Power transmission	VersaPlanetary ring gear	-	VexPro	217-2816	1	0	1	EA	\$ 9.99	\$ 9.99
Sorter	Power transmission	VersaPlanetary 9:1 gear stage	-	VexPro	217-3106	1	0	1	EA	\$ 14.99	\$ 14.99
Sorter	Power transmission	VersaRoller Hub	Glass filled nylon	VexPro	217-5896	4	0	4	EA	\$ 3.99	\$ -
Sorter	Power transmission	VersaRoller Hub insert, 5/16-18 tapped	6061-T6	VexPro	217-5897	3	0	3	EA	\$ 3.99	\$ -
Sorter	Power transmission	Flanged bearing 3/8 ID x 7/8 OD	-	Amazon	-	3	0	3	EA	\$ 2.00	\$ -
Magazine	Electronic	SPARK MAX	-	Rev Robotics	REV-11-2158	2	0	2	EA	\$ 75.00	\$ 150.00
Magazine	Motor	NEO 550	-	Rev Robotics	REV-21-1651	2	0	2	EA	\$ 25.00	\$ 50.00
Magazine	Power transmission	VersaPlanetary v2 base kit, 1/2" hex out	-	VexPro	217-4973	2	0	2	EA	\$ 39.99	\$ 79.98
Magazine	Power transmission	VersaPlanetary ring gear	-	VexPro	217-2816	4	0	4	EA	\$ 9.99	\$ 39.96
Magazine	Power transmission	VersaPlanetary 4:1 gear stage	-	VexPro	217-2818	4	0	4	EA	\$ 14.99	\$ 59.96
Magazine	Power transmission	VersaRoller Hub	Glass filled nylon	VexPro	217-5896	8	0	8	EA	\$ 3.99	\$ -
Magazine	Power transmission	VersaRoller Hub insert, 5/16-18 tapped	6061-T6	VexPro	217-5897	5	0	5	EA	\$ 3.99	\$ -
Magazine	Power transmission	VersaRoller Hub insert 2-1/2 LG	7075	VexPro	217-5899	1	0	1	EA	\$ 6.99	\$ 6.99
Magazine	Power transmission	Flanged bearing 1/2 hex ID x 1-1/8 OD	-	VexPro	217-3875	3	0	3	EA	\$ 4.99	\$ -
Magazine	Power transmission	Flanged bearing 3/8 ID x 7/8 OD	-	Amazon	-	5	0	5	EA	\$ 2.00	\$ -
Magazine	Power transmission	Sprocket 18T #25 1/2 hex bore	7075-T6	VexPro	217-3488	1	0	1	EA	\$ 7.99	\$ 7.99
Magazine	Power transmission	Sprocket 22T #25 1/2 hex bore	7075-T6	VexPro	217-2640	1	0	1	EA	\$ 9.99	\$ 9.99
Magazine	Wheel	Colson 2-1/2 x 1-1/4 x 1/2 hex bore	-	VexPro	217-4046	2	0	2	EA	\$ 6.99	\$ 13.98
Magazine	Sensor	IR break beam sensor	-	Adafruit	2168	2	0	2	EA	\$ 6.50	\$ 13.00
Shooter-climber	Electronic	Talon SRX Universal Breakout	-	AndyMark	am-3281	2	0	2	EA	\$ 15.00	\$ 30.00
Shooter-climber	Electronic	SPARK MAX	-	Rev Robotics	REV-11-2158	2	0	2	EA	\$ 75.00	\$ 150.00
Shooter-climber	Motor	NEO	-	Rev Robotics	REV-21-1650	2	2	0	EA	\$ 40.00	\$ -
Shooter-climber	Power transmission	Flanged bearing 13.75mm ID x 1-1/8 OD	-	VexPro	217-4006	4	0	4	EA	\$ 4.99	\$ -
Shooter-climber	Power transmission	One way roller bearing 3/4 ID x 1 OD x 1/2	-	VXB.com	KIT8653	2	0	2	EA	\$ 10.37	\$ 20.74
Shooter-climber	Power transmission	Gear 20DP 28T 1/2 hex bore	7075-T6	VexPro	217-5467	1	0	1	EA	\$ 10.99	\$ 10.99
Shooter-climber	Power transmission	Gear 20DP 76T 1/2 hex bore	7075-T6	VexPro	217-5479	1	0	1	EA	\$ 24.99	\$ 24.99
Shooter-climber	Power transmission	Gear 20DP 12T 8mm keyed bore	4140 steel	AndyMark	am-0741	2	0	2	EA	\$ 10.00	\$ 20.00
Shooter-climber	Power transmission	Belt HTD 5mm pitch, 9mm width, 93 teeth	Neoprene, fiberglass	V-Belt Guys	480-5M-09	2	0	2	EA	\$ 1.84	\$ -
Shooter-climber	Power transmission	Belt HTD 5mm pitch, 9mm width, 56 teeth	Neoprene, fiberglass	V-Belt Guys	280-5M-09	2	0	2	EA	\$ 1.84	\$ -
Shooter-climber</											

Controls	Wiring	Snap Action circuit breaker 30A	-	VexPro	217-0205	5	2	4	EA	\$ 4.99	\$ -	2 KOP Black tote, <\$5
Controls	Wiring	Snap Action circuit breaker 5A	-	AndyMark	am-2096	2	0	2	EA	\$ 6.00	\$ 12.00	
Controls	Electronic	Robot radio	-	Open Mesh Networks	OM5P-AC	1	1	0	EA	-	\$ -	KOP Black tote
Controls	Electronic	Ethernet Switch - 5 Port - 12v	-	Brainboxes	SW-005	1	0	1	EA	\$ 41.67	\$ 41.67	
Controls	Electronic	Power distribution panel	-	CTRE	14-806880	1	1	0	EA	\$ 204.99	\$ -	KOP Gray tote
Controls	Electronic	Voltage regulator module	-	CTRE	14-868277	1	1	0	EA	\$ 44.99	\$ -	KOP Gray tote
Controls	Electronic	Robot status light	-	Allen Bradley	855PB-B12ME522	1	1	0	EA	-	\$ -	KOP Black tote
Controls	Wiring	POE injector cable	-	REV Robotics	REV-11-1210	1	1	0	EA	\$ 6.79	\$ -	KOP Black tote
Controls	Electronic	Panel volt meter	-	Adafruit	575	1	0	1	EA	\$ 7.95	\$ 7.95	
Controls	Sensor	Pigeon IMU	-	CTRE	16-737785	1	0	1	EA	\$ 59.99	\$ 59.99	
Controls	Electronic	CAN connector block of 5	-	CTRE	15-676778	2	0	2	EA	\$ 19.99	\$ 39.98	
Controls	Miscellaneous	AustriAlpin COBRA Buckle	7075	Amazon	-	1	0	1	EA	\$ 29.99	\$ 29.99	
Vision	Electronic	HAUSBELL flashlight	-	Amazon	-	1	0	1	EA	\$ 3.75	\$ -	<\$5
Vision	Electronic	AA battery eliminator	-	Amazon	-	1	0	1	EA	\$ 19.99	\$ 19.99	
Vision	Electronic	Limelight v2 camera	-	Limelight	-	1	0	1	EA	\$ 399.99	\$ 399.99	
Pneumatics	Pneumatic	Double solenoid 24V	-	SMC	SY3240-5MZ	3	0	3	EA	\$ 70.64	\$ 211.92	
Pneumatics	Pneumatic	Pneumatic control module	-	CTRE	14-806777	1	1	0	EA	\$ 88.99	\$ -	KOP Gray tote
Pneumatics	Pneumatic	Manifold 4 port	-	VexPro	217-2952	1	0	1	EA	\$ 44.99	\$ 44.99	
Pneumatics	Pneumatic	Pressure regulator	-	AutomationDirect	PRU14	1	0	1	EA	\$ 21.50	\$ -	AutomationDirect voucher
Pneumatics	Pneumatic	Pressure gauge	-	AutomationDirect	PGU14	2	0	2	EA	\$ 18.50	\$ 37.00	
Pneumatics	Pneumatic	Manual valve	-	AutomationDirect	HVU14-2	1	0	1	EA	\$ 12.00	\$ -	AutomationDirect voucher
Pneumatics	Pneumatic	Tank	Polypropylene	Clippard	AVT-PP-35	1	1	0	EA	\$ 14.00	\$ -	KOP Gray tote
Pneumatics	Pneumatic	Tank mounting bracket	PVC	Clippard	AVT-PP-CL	4	0	4	EA	\$ 1.82	\$ -	<\$5
Pneumatics	Pneumatic	Compressor	-	Viair	90C	1	1	0	EA	\$ 69.00	\$ -	KOP Gray tote
Pneumatics	Pneumatic	Pressure relief valve	Brass	McMaster-Carr	48435K71	1	0	1	EA	\$ 5.26	\$ 5.26	
Pneumatics	Pneumatic	Pressure switch	Brass	Nason	SM-2B-115R/443	1	1	0	EA	\$ 29.00	\$ -	KOP Gray tote
Total											\$4,528.49	

Subsystem
Drivetrain
Magazine
Intake
Sorter
Shooter-climber
Telescope
Colorator
Bumper
General materials
Vision
Controls
Pneumatics

Component Type
Electronic
Sensor
Motor
Wiring
Pneumatic
Aluminum stock
Wheel
Chain
Power transmission
Plastic stock
Spring/stored energy
Miscellaneous