



Heavy Civil Infrastructure

Work Breakdown Structure

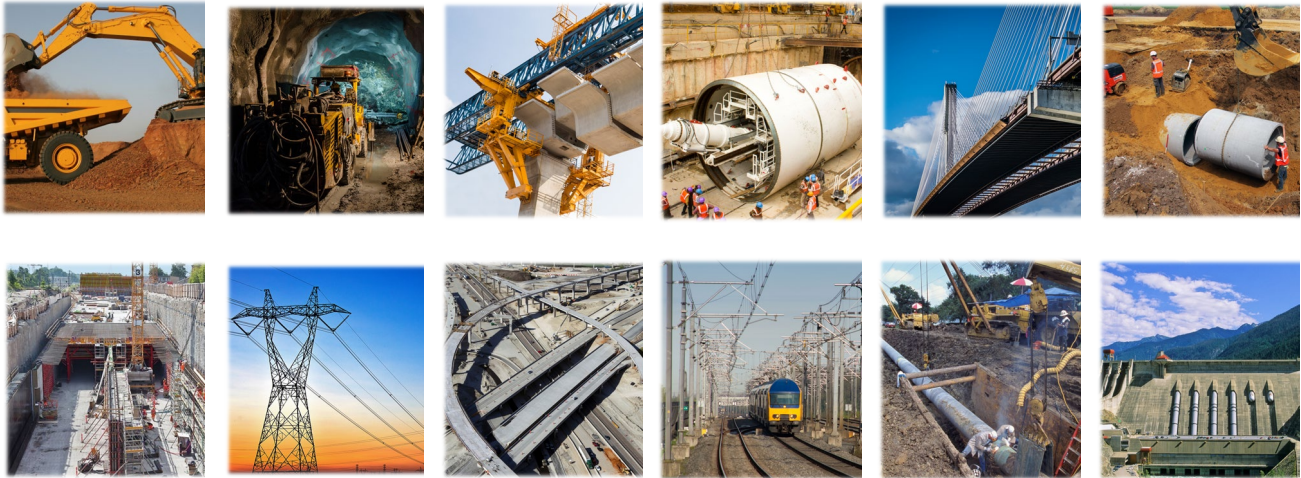
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HCI Work Breakdown Structure



HCI stands for Heavy Civil & Infrastructure Construction. The Cost Books & Master Estimate files are based on decades of experience estimating Heavy Civil and Infrastructure Projects in North America and around the world. These projects have included some of the largest infrastructure projects anywhere, including Bridges, Highways, Hydro Electric Projects, Tunnels, Light Rail Transit Projects and Transmission Lines.

The Master Estimates are organized to follow a Work Breakdown Structure (WBS) specifically designed by HCI for Heavy Civil & Infrastructure Construction. The structure follows a 10-digit multi-level drill down compatible with current estimating software. The resource rates, crews and estimate assemblies included with the HCI files follows this work breakdown structure.

Heavy Civil Infrastructure Work Breakdown Structure (WBS)

1. Site Preparation & Earthworks
2. Shoring & Tunneling
3. Sewer & Watermain
4. Foundations & Structures
5. Paving & Siteworks
6. Track & Catenary System
7. Power Distribution & Lighting
8. Mechanical Piping & Building Fit-out
9. Contractor Indirect Costs

Heavy Civil & Infrastructure Work Breakdown Structure (WBS)

Section	Description	Section	Description
1-Site Preparation & Earthworks			
1100	Site Investigation	1600	Dewatering
1110	Test Holes	1610	Water Pumping
1120	Site Monitoring	1620	Well Point Dewatering
1200	Erosion Control	1630	Containment Barriers
1210	Silt Fences & Curtains	1640	Reservoir Liners
1220	Erosion Mats & Blankets	1700	Earth Stabilization
1230	Sediment Traps	1710	Wick Drains
1240	Rockfall Fences	1720	Geotextile Fabrics & Grids
1250	Safety Booms	1730	Slope Protection
1300	Site Access	1740	Subgrade Stabilization
1310	Access Mats & Crane Pads	1750	Rock Face Preparation
1320	Access Structures	1800	Excavation & Backfill
1330	Access Roads	1810	Topsoil Stripping
1400	Clearing & Grubbing	1820	Common Excavation
1410	Crop & Prune Trees	1830	Rock Excavation
1420	Clearing	1840	Structural Excavation
1430	Grubbing	1850	Marine Excavation
1500	Removals & Demolition	1900	Truck Haul
1510	Site Removals	1910	Truck Haul Tandem Dump Trucks
1520	Pavement Removals	1920	Truck Haul Triaxle Dump Trucks
1530	Utility Removals	1930	Truck Haul Tractor Trailers
1540	Concrete Removals	1940	Truck Haul Bottom Dump Trailers
1550	Steel Removals	1950	Truck Haul Earth Off Highway Trucks
1560	Bridge Removals	1960	Truck Haul Rock Off Highway Trucks
1570	Building Removals		
1580	Equipment Removals		
1590	Hazardous Removals		

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Section	Description	Section	Description
2-Shoring & Tunneling			
2100	Support of Excavation	2500	Shaft Excavations
2110	Rock & Soil Anchors	2510	Drill & Blast Shafts
2120	Shotcrete Support	2520	Raisebore Shafts
2130	Steel Sets & Liner Plate	2530	Mine Shafts
2140	Soldier Piles & Lagging		
2150	Steel Sheetpiles	2600	Drill Blast Cavern Excavation
2160	Diaphragm Slurry Walls	2610	Drill & Blast Caverns
2170	Bin & Block Walls	2620	Muck Cavern Benches
2180	Stabilized Earth Walls		
2190	Secant Pile Walls	2700	Trenchless Excavation
		2710	Jack & Bore Casing
2200	Drill & Blast Tunnels	2720	Directional Drilling
2210	Mobilize Drill Blast Tunnels		
2220	Drill Blast Full Face Tunnels	2800	Underground Services
2230	Drill Blast Heading & Bench	2810	Portal Services
2240	Rehandle Blasted Muck	2820	Linear Plant
		2830	Operate Services
2300	Bored TBM Tunnels	2840	Water Treatment
2310	Mobilize TBM Tunnels	2850	Clean Finish Tunnels
2320	Drive TBM Tunnels		
2330	TBM Maintenance & Support	2900	Underground Equipment
2340	TBM Interventions	2910	Underground Drills
2350	Rehandle TBM Muck	2920	Tunnel Boring Machines
		2930	Pressure Balance Systems
2400	Mined Excavations	2940	Raise Bore Machines
2410	Mobilize Mined Tunnels	2950	Roadheader Equipment
2420	Mine Heading & Bench	2960	Mucking Equipment
2430	Sequential Excavation (SEM)	2970	Support Equipment
2440	Mine Cross Passages		
2450	Rehandle Mined Muck		

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3-Sewer & Watermain			
3100	Storm Sewers	3500	Water Distribution
3110	Storm Sewer in Open Trench	3510	Watermain Pipe
3120	Storm Sewer in Retained Trench	3520	Watermain Fittings
3130	Storm Sewer Services	3530	Water Services
		3540	Fire Hydrants
3200	Drainage Culverts	3600	Manholes & Catchbasins
3210	Corrugated Pipe Culverts	3610	Catchbasins & Ditch Inlets
3220	Corrugated Arch Culverts	3620	Manholes & Chambers
3230	Precast Concrete Culverts	3630	Frames & Grates
		3640	Clean & Bench Manholes
3300	Subdrainage	3700	Trench & Utility Support
3310	Subdrains	3710	Support Utilities
3320	Drainage Fabrics	3720	Trench Boxes
3330	Deck Drainage	3730	Pavement Protection
3340	Pressure Relief Drains		
3400	Sanitary Sewers	3800	Sewer Bedding & Backfill
3410	Sanitary Sewer in Open Trench	3810	Sewer Bedding
3420	Sanitary Sewer in Retained Trench	3820	Sewer Cover
3430	Sanitary Services	3830	Sewer Backfill

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Section	Description	Section	Description
4-Foundations & Structures			
4100	Foundation Piles	4600	Precast Concrete
4110	Driven Piles	4610	Bridge Precast Concrete
4120	Drilled Caissons	4620	Elevated Guideway Precast
4130	Helical Screw Piles	4630	Tunnel Precast Segments
4140	Micropiles	4640	Dam Precast Concrete
		4650	Building Precast Concrete
		4660	Precast Specialties
4200	Structure Falsework	4700	Grouting
4210	Access Scaffold	4710	Pressure Grouting
4220	Concrete Scaffold	4720	Fissure Grouting
4230	Steel Falsework	4730	Jet Grouting
4240	Timber Falsework	4740	Surface Grouting
4250	Erection Towers	4750	Backfill Grouting
4260	Heavy Soffit Falsework	4760	Anchor Grouting
		4770	Grout Pads
		4780	Post Tension Grouting
4300	Concrete Formwork	4800	Structural Steel & Metals
4310	Fabricate Formwork	4810	Structural Steel
4320	Bridge Structure Formwork	4820	Cable Stays
4330	Water Control & Hydro Formwork	4830	Steel Liner Plate
4340	Underground Formwork	4840	Steel Gates & Trashracks
4350	Containment Structure Formwork	4850	Anchor Bolts & Inserts
4360	Equipment Foundation Formwork	4860	Miscellaneous Metal
4370	Building Formwork	4870	Expansion Control
4380	Site Formwork	4880	Metal Deck
		4890	Fabricate Steel
4400	Concrete Reinforcement	4900	Waterproofing & Insulation
4410	Reinforcing Steel	4910	Waterstop
4420	Concrete Dowels	4920	Waterproofing
4430	Reinforcing Fabrics	4930	Vapour Barrier
4440	Welded Wire Mesh	4940	Joint Filler
4450	Reinforcing Fibres	4950	Joint Sealer
4460	Stressing Strand	4960	Exterior Insulation
4470	Post-Tensioning Bars		
4510	Cast in Place Concrete		
4510	Batch Concrete		
4520	Structural Concrete		
4530	Roller Compacted Concrete		
4540	Screed & Finish Concrete		
4550	Cure & Protect Concrete		
4560	Readymix Concrete		

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Section	Description	Section	Description
5-Paving & Siteworks			
5100	Process Aggregate	5600	Fence & Sound Wall
5110	Process Embankment Fills	5610	Chainlink Fence
5120	Process Granular Base	5620	Wire Fence
5130	Process Rock Fills	5630	Safety Fence
5140	Process Dam Filters	5640	Privacy Fence
5150	Process Concrete Aggregate	5650	Sound Wall
		5660	Animal Barriers
		5670	Operational Gates
5200	Granular Base	5700	Traffic Barrier & Guiderail
5210	Purchase Granular	5710	Concrete Barrier
5220	Load Granular	5720	Traffic Guide Rail
5230	Haul Granular	5730	Energy Attenuators
5240	Place Granular Base	5740	Pipe Bollards
5250	Fine Grade Granular Base		
5300	Asphalt Paving	5800	Traffic Signs
5310	Batch Asphalt	5810	Post Mounted Signs
5320	Asphalt Mixes	5820	Sign Support Structures
5330	Haul Asphalt	5830	Sign Support Spans
5340	Place Asphalt	5840	Electronic Message Boards
5350	Coat Asphalt	5850	Identification & Warning Signs
5360	Reinforce Asphalt		
5370	Asphalt Curb	5900	Landscaping
5380	Asphalt Sidewalk	5910	Topsoil
5390	Asphalt Sweeping	5920	Seed & Sod
5400	Concrete Paving & Flatwork	5930	Planting
5410	Concrete Paving	5940	Hardscape
5420	Concrete Curb & Gutter	5950	Streetscape
5430	Concrete Sidewalk		
5500	Pavement Markings		
5510	Line Marking		
5520	Symbol Marking		
5530	Marking Removals		
5540	Raised Pavement Markers		
5550	Rumble Strips		

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Section	Description	Section	Description
6-Track & Catenary System			
6100	Track Removals	6500	Special Track
6110	Remove Track	6510	Turnouts
6120	Remove Ballast	6520	Crossovers
6130	Remove Special Track	6530	Guantlets
6140	Remove Road Crossings	6540	Diamonds
		6550	Switchbacks
		6556	Track Tie-ins
6200	Ballasted Trackbed	6600	Track Appurtenances
6210	Ballast Mats	6610	Track Equipment
6220	Track Ballast	6620	Track Crossings
6230	Track Ties		
6300	Concrete Trackbed	6700	Overhead Catenary System (OCS)
6310	Skeletonize Track	6710	Catenary Poles
6320	Concrete Track Slabs	6720	Catenary Cantilevers
6330	Concrete Transition Slabs	6730	Catenary Guys & Headspans
6340	Concrete Plinths	6740	Catenary Terminations & Anchors
6350	Concrete Embedment	6750	Catenary Hangers
6360	Floating Track Slabs	6760	Catenary Wire
6370	Track Reinforcing Steel	6770	Catenary Rigid Rail
		6780	Catenary Connects
6400	Track Rail		
6410	Track Running Rail		
6420	Track Guard Rail		
6430	Track Rail Joints		
6440	Track Rail Hardware		

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Section	Description	Section	Description
7-Power Distribution & Lighting			
7100	Transmission Line	7500	Connections & Terminations
7110	Foundations	7510	Connections
7120	Transmission Poles	7520	Terminations
7130	Steel Lattice Towers	7530	Cable Splices
7140	Tower Guys	7540	Stress Cones
7150	High Voltage Conductors		
7160	Optical Ground Wire	7600	Traffic Luminaires
7170	Counterpoise	7610	Standard Luminaires
7180	Line Insulators	7620	High Mast Luminaires
7190	Line Hardware	7630	Navigation Lights
7200	Light & Signal Poles	7700	Traffic Signals
7210	Pole Bases	7710	Traffic Signal Heads
7220	Overhead Poles	7720	Pedestrian Signal Heads
7230	Pole Brackets	7730	Flasher Mechanisms
7240	Pole Guys	7740	Traffic Detection
7300	Ductbank & Conduit	7800	External Grounding
7310	Cable Ductbanks	7810	Ground Rods
7320	Cable Raceways	7820	Ground Wire
7330	Manholes & Pullboxes	7830	Ground Connections
7340	Conduit	7840	Ground Structures
7350	Conduit Fittings	7850	Ground Grids
		7860	Lightning Protection
		7870	Ground Cadwelds
7400	Cable & Wire	7900	Electrical Equipment
7410	Extra Low Voltage Cable	7910	Power Supply Equipment
7420	Low Voltage Cable	7920	Modular Substations
7430	Medium Voltage Cable	7930	Hydro Balance of Plant
7440	Fibre Optic Cable	7940	Station Electrical
7450	Coaxial Cable		
7460	AWG Wire		
7470	Cable Accessories		

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Section	Description	Section	Description
8-Mechanical Piping & Building Fit-Out			
8100	Cross Country Pipeline	8500	Bridge Mechanical
8110	Mainline Pipeline	8510	Pier Tower Elevators
8120	Distribution Pipeline	8520	Maintenance Gantries
8200	Steel Pressure Pipe	8600	Tunnel Mechanical
8210	Steel Pipe Supply	8610	Tunnel Jet Fans
8220	Steel Pipe Fittings	8620	Tunnel Fire Suppression
8230	Pipe Protection		
8300	Polyethylene Pipe	8900	Building Fit-Out
8310	Polyethylene Pipe Supply	8910	Building Enclosure
8320	Polyethylene Fittings	8920	Thermal Protection
		8930	Doors & Windows
		8940	Interior Finishing
8400	Hydro Mechanical	8950	Station Accessories
8410	Turbines & Generators	8960	Furniture & Equipment
8420	Balance of Plant	8970	Conveying Equipment
8430	Powerhouse Cranes	8990	Station Mechanical
8440	Rubber Dams		

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Section	Description	Section	Description
9-Contractor Indirect Costs			
9100	Site Supervision	9500	Site Services
9110	Management	9510	Site Maintenance
9120	Supervision	9520	Sanitary Services
9130	Engineering	9530	Electrical Services
9140	Administration	9540	Compressed Air & Water
9150	Site Services	9550	Material Handling
9160	Safety & Security	9560	Transportation Services
9170	Quality	9570	Survey Expense
9180	Environmental	9580	Technical Services
9190	Public Relations	9590	Emergency Services
9200	Staff Facilities & Expenses	9600	Equipment Services
9210	Staff Vehicles	9610	Equipment Mobilization
9220	Staff Office Facilities	9620	Equipment Shop
9230	Staff Office Furniture & Equipment	9630	Equipment Servicing
9240	Staff Office Expenses	9640	Unallocated Equipment Costs
9250	Staff Communications Expense		
9260	Staff Computer Expense	9700	Travel & Subsistence
9270	Staff Safety Expense	9710	Travel
		9720	Subsistence
9300	Craft Facilities & Expenses	9800	Camp & Catering
9340	Craft Unallocated Labor Cost	9810	Camp Construction
9310	Craft Lunch & Washroom Facilities	9820	Camp Catering
9320	Craft Safety Expense		
9330	Craft Small Tools & Supplies	9900	Fees & Margin
9400	Site Infrastructure	9910	Administration Fees
9410	Yard & Laydown Facilities	9920	License Fees & Permits
9420	Water & Power Facilities	9930	Engineering Design Fees
9430	Warehouse Facilities	9940	Proposal Costs
9440	Temporary Access Facilities	9950	Escalation
9450	Site Access Roads	9960	Bid Security
9460	Weather Enclosures	9970	Insurance
		9980	Contingency
		9990	Overhead & Profit