MONTANA INDIVIDUAL ENGINEERING PRACTICES

Name:_____ Title:_____ Date:_____

Recommended by:_____ Date:_____

Concurred by:_____ Date:_____

Delegated by:_____ Date:_____

PRACTICE (Discipline)	PRACTICE CODE	CONTROLLING FACTOR	UNITS	JOB CLASS					RESPONSIBILITY LIMITS		
				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
All Practices		Hazard Class – see NEM 501.7C	Class	- - - -	- - - -	- - - -	- - - -	- - - -	Low	Low	Low
Air Filtration and Scrubbing	371	Bio-filters	cfm	50,000	100,000	500,000	1,000,000	All			
		Others	cfm	50,000	100,000	500,000	1,000,000	All			
Access Road	560	Road Length	miles	0.25	0.5	1	2	All			
		Culvert Diameter	inches	18	24	48	60	72			
		Box Culvert	sq. ft.	None	None	None	16	25			
		Bridge Span	feet	None	None	None	None	None			
Agrichemical Handling Facility	309	Mixing and Handling	sq. ft.	None	None	500	1,000	All			
		Fertilizer Containment	gallon	None	None	5,000	15,000	All			
		Herbicide/Pesticide Containment	gallon	None	None	5,000	15,000	All			
Anaerobic Digester	366	Design Capacity	cu. ft.	None	None	None	None	None			
Animal Mortality Facility (see Roofs and Covers)	316	On-Farm Animal Units	number	100	300	500	1,000	All			
		Catastrophic Mortality	number	None	None	None	None	None	Consult SCE	and	State Vet
		Bin Composter (Standard Plan) 1/	each	None	None	None	All	- - - -			
		In-Vessel Composter (Vendor) 2/	each	None	None	None	All	- - - -			
Animal Trails and Walkways	575	Slope (Cross Section)	H/V	None	10:1	5:1	All	- - - -			
		Soils	texture	None	Fine	Coarse	All	- - - -			
		Surface Treatment	type	None	Vegetative	Non-Veg	All	- - - -			
		Water Gap Width	feet	None	20	30	All	- - - -			
Aquatic Organism Passage (e.g., Denil Ladder)	396	Length	feet	None	6	12	18	24			
		Drop Height	feet	None	1	2	3	4			
Channel Bed Stabilization	584	(See Open Channel Code 582)									

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Clearing and Snagging	326	Capacity-Bankfull	cfs	150	300	500	750	1,000			
		Velocity-Bankfull	fps	2	4	6	8	10			
		Reach Length	feet	1,000	2,500	5,000	15,000	All			
Closure of Waste Impoundments	360	Storage Volume	cu. ft.	None	50,000	150,000	500,000	All			
Combustion System Improvement	372	Replacement—Orchard Frost Protection	acres	1	2	3	4	All			
		Replacement—Mobile Equipment	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
		Replacement—Engines	Hp	20	60	120	280	420			
Composting Facility (see Roofs and Covers)	317	On-Farm Animal Units	number	100	300	500	1,000	All			
Dam, Diversion	348	Streamflow (25-year Frequency)	cfs	None	500	1,000	1,500	2,000			
		Flow Diverted	cfs	None	15	50	150	200			
		Height of Drop	feet	None	2	4	6	8			
Dam (see Pond)	402	Drainage Area	sq. mi.	None	None	None	None	20			
		Effective Height	feet	None	None	None	None	35			
Dike	356	Water Height	feet	None	None	4	8	12	Consult SCE		
		Hazard Class	class	None	None	III Low	III Low	III Low	Consult SCE		
Diversion	362	Design Capacity	cfs	10	25	100	200	500			
Dry Hydrant	432	Static Head	feet	None	5	10	15	All			
Dust Control on Unpaved Road and Surfaces	373	Application of Water	miles	0.5	1	5	10	All			
		Application of Salts or Oils	miles	0.5	1	5	10	All			
Dust Control on Open Feedlot Surfaces	375	Manure Management	acres	1	5	10	20	All			
		Sprinkler Systems	acres	1	5	10	20	All			
Fish Screen	700	Capacity	cfs	2	5	15	50	100	Consult SCE		

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Grade Stabilization Structure (see Structure for Water Control)	410	Drainage Area	acres	20	100	250	640	12,800			
		Embankment Height	feet	None	6	8	10	35			
Grassed Waterway	412	Capacity	cfs	25	50	100	200	500			
Heavy Use Area Protection	561	Wind Shelter Wall Height	feet	6	8	10	12	14			
		Soil	type	Gravel	Sand	Silt/Clay	Saturated	All			
		Surface Area	acres	0.1	0.5	1	5	All			
		Surface Treatment	type	Veg	Gravel	Lime	Concrete	Asphalt			
Irrigation Canal or Lateral	320	Design Capacity	cfs	None	25	50	150	500			
Irrigation Field Ditch	388	Design Capacity	cfs	5	10	15	50	100			
Irrigation Land Leveling	464	Cut Volume per Acre	cy/ac	250	350	500	1,000	All			
		Maximum Cut Depth	inches	6	12	18	24	All			
Irrigation System											
Micro-Irrigation	441	Irrigated Area	acres	1	5	10	40	All			
Sprinkler	442	Irrigated Area	acres	40	80	160	640	All			
Surface and Subsurface	443	Irrigated Area	acres	40	80	160	320	640			
	Gated Pipe	Maximum Head	feet	None	10	15	25	All			
		Minimum Head	feet	None	5	1	All	- - - -			
Irrigation Ditch Lining	428	Capacity	cfs	None	20	50	100	200			
		Velocity	fps	None	2	4	6	All			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Irrigation Pipeline	430	**Pumped Capacity**: Operating Pressure									
		< 50 psi.	gpm	900	1,800	2,700	4,000	5,000			
		> 50 psi	gpm	500	1,000	1,800	3,000	3,500			
		Gravity Capacity: Static Pressure									
		< 50 psi.	gpm	900	1,800	2,700	4,000	5,000			
		> 50 psi	gpm	500	1,000	1,800	3,000	3,500			
		Maximum Pressure	psi	60	80	100	125	All			
Irrigation Water Management	449	Management Level	level	I	II	III	- - - -	- - - -			
		Irrigated Area	acres	40	160	320	640	All			
Land Reclamation Landslide Treatment	453			None	None	None	None	None			
Toxic Discharge Control				None	None	None	None	None			
Land Smoothing	466	Area Treated	acre	10	20	30	40	All			
		Maximum Cut Depth	inches	6	12	18	24	All			
Lined Waterway or Outlet	468	Capacity	cfs	None	50	100	150	All			
Monitoring Well	353	Depth	feet	10	Consult SCE and Licensed Well Constructor						
Obstruction Removal	500	Non-Hazardous Materials	acres	1	3	5	10	All			
		Hazardous Materials	acres	None	None	None	None	None			
Open Channel	582	Capacity—Bankfull	cfs	150	300	500	750	1,000			
		Velocity—Bankfull	fps	2	4	6	8	10			
		Thalweg Depth—Bankfull	feet	2	4	6	8	10			
		Stream Type	Rosgen	None	None	C E	C, B, E & F	A - G			

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Pipeline	516	Total Length--Main and Laterals	miles	1	2	5	10	30			
		Maximum Diameter	inches	1.5	2	3	4	8			
		Maximum Pressure	psi	60	100	200	300	400			
		Maximum Flow Rate	gpm	5	10	15	20	All			
Pond (Embankment) (see Structure for Water Control for outlet works)	378	Hazard Class	class	A	A	A	A	A			
		Drainage Area	sq. mi.	1	2	5	10	20			
		Effective Height	feet	4	10	15	25	35			
		Storage times Height	ac-ft/ft.	10	500	1,500	2,000	3,000			
Pond (Excavated)	378	Drainage Area	sq. mi.	1	2	5	10	20			
		Storage	ac-ft	1.5	3	5	All	- - - -			
Pond Sealing or Lining	521	Treatment Area	acre	None	0.5	1	3	5			
		Height of Embankment	feet	4	6	8	12	All			
Precision Land Forming (e.g. Feedlots)	462	Shaped and Graded Area	acre	1	2	5	10	All			
		Cut Volume per Acre	cy/ac	500	1,500	2,500	3,500	All			
		Maximum Cut Depth	inches	6	12	24	All	- - - -			

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Pumping Plant	533	**Centrifugal Pump**: Design Capacity	gpm	500	1,000	1,800	3,000	3,500			
		Static Head	feet	100	165	205	265	350			
		Turbine Pump: Design Capacity	gpm	500	1,000	1800	3,000	3,500			
		Static Head	feet	100	165	265	400	500			
(Submersible and Piston)		**Low Volume Pump**: Design Capacity	gpm	5	10	20	30	50			
		Static Head	psi	60	100	200	300	400			
(Trailer or Flood Pump)		**High Volume Low Head Pump**: Design Capacity	gpm	2,000	5,000	10,000	15,000	20,000			
		Static Head	feet	10	20	30	40	50			
		Pit Pump (waste 4-8% solids): Total Pipeline Length	feet	None	None	500	1,500	All			
		Design Capacity	gpm	None	None	None	400	800			
		Static Head	psi	None	None	80	100	125			
		Piston Pump (waste > 8% solids): Total Pipeline Length	feet	None	None	75	150	All			
Roofs and Covers	367	Roof Area	sq. ft.	500	1,000	2,000	5,000	All	Consult SCE		
		Roof Span	feet	None	20	30	40	50	Consult SCE		
		Foundation	type	None	None	None	Post	Concrete Wall	Consult SCE		
		Geo Cover and Biogas Transfer	sq. ft.	None	None	None	None	None	Consult SCE		
Roof Runoff Structure	558	Roof Area	sq. ft.	500	1,500	3,000	6,000	All			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Solid/Liquid Waste Separation Facility	632	Settling Basin Volume	ac-ft	None	0.1	0.5	1	All			
		Weeping Wall Height	feet	None	4	6	8	10			
		Screw Press (Vendor) 2/	each	None	None	None	None	All			
		Rotating/Travel Screens (Vendor) 2/	each	None	None	None	None	All			
Spring Development	574	Water Source	type	Fractured Rock	Flowing Water	Surface Wetness	Non-Wet Surface	All			
		Flow Quantity	gpm	> 10	> 5	> 1	All	- - - -			
Stormwater Runoff Control	570	Disturbed Area (see Sediment Control Basin or Pond)	acre	10	20	30	60	All			
Streambank Protection	580	Capacity – Bankfull	cfs	150	300	500	1,000	5,000			
		Velocity – Bankfull	fps	2	4	6	8	10			
		Thalweg Depth – Bankfull	feet	2	4	6	8	10			
		Stream Type	Rosgen	None	None	C E	C, B, E & F	A-G			
Shoreline Protection		Distance from Shore to Property	feet	None	None	> 40	20-40	< 20			
		Raw Bank Height 3/	feet	None	None	5	10	20			
		Wave Protection 4/	feet	None	None	2	2.5	3			
Stream Crossing	578	Channel bankfull flow	cfs	None	None	50	300	All			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Structure for Water Control	587	**Straight Drop and Box Inlet Spillway:**									
		Net Drop	feet	None	3	4	6	8	Consult SCE		
		Capacity	cfs	None	5	15	50	500	Consult SCE		
		Weir Depth	feet	None	1	2	3	4	Consult SCE		
		Check Structure:									
		Net Drop	feet	None	3	4	6	8			
		Capacity	cfs	None	5	15	50	500			
		Weir Depth	feet	None	1	2	3	4			
		Conduit:									
		Diameter	inches	12	18	24	36	48			
		Capacity	cfs	5	15	50	100	200			
		Maximum Head	feet	4	10	15	25	35			
		Wall Design:									
		Height	feet	None	4	6	8	10			
		Cast Concrete Drop Inlet for Pipe:									
		Net Drop	feet	None	3	4	6	8			
		Capacity	cfs	None	5	15	50	200			
		Slide Gate:									
		Head ≥ 10 feet	cfs	None	None	15	50	200			
		Head < 10 feet	cfs	2	5	15	50	200			
		Trash Screen:									
		Capacity	cfs	2	5	15	50	200			
		Siphon:									
		Capacity	cfs	None	40	60	80	100			
		Minimum Head Loss	ft/100 ft	None	1	0.75	0.5	0.25			
		Maximum Static Head	feet	0	4	6	8	10			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Structure for Water Control (continued)	587	**Long Span Supported Pipe:**									
		Capacity	cfs	None	None	4	8	10			
		Diameter	inches	None	None	15	24	All			
		Span	feet	None	None	15	20	All			
		Height	feet	None	None	6	8	All			
		Concrete or Articulated Chutes:									
		Net Drop	feet	2	4	6	8	10			
		Weir Drop	feet	0.5	1	1.5	2	3			
		Weir Capacity	cfs	10	25	50	100	300			
		Rock Chutes:									
		Controlled Drop	feet	2	4	6	8	10			
		Chute Capacity	cfs	10	25	50	100	200			
		Toe Walls (Standard Plan) : [1/]									
		Net Drop	feet	2	3	4	5	6			
		Weir Capacity	cfs	None	50	100	200	300			
Subsurface Drain	606	Area Drained	acre	20	40	60	80	All			
		Pipe Diameter	inches	4	6	8	10	All			
		Interception Drain [5/]	length	150	500	1,000	1,500	2,000			
Surface Drainage Field Ditch	607	Design Capacity	cfs	5	10	15	50	100			
		Design Velocity	fps	2	4	6	All	- - - -			
Surface Drainage Main / Lateral	608	Design Capacity	cfs	10	25	50	100	200			
		Design Velocity	fps	2	4	6	8	10			
Underground Outlet	620	Pipe Diameter	inches	6	8	10	12	18			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Waste Storage Facility (see Pond Sealing or Lining)	313	Pond Storage Capacity	cu. ft.	None	50,000	150,000	500,000	2,000,000			
		Water Table Depth Below Bottom	feet	None	> 10	6-10	4-6	< 4			
		Bedrock Depth Below Bottom	feet	None	> 10	6-10	4-6	< 4			
(e.g., Slurry store or Weiser Tanks)		Concrete Tank	cu. ft.	None	10,000	50,000	75,000	100,000			
		Wall Height (Design)	feet	None	None	6	8	10			
		Top Span (Design)	feet	None	None	8	12	16			
		Wall Height (Standard Plan) 1/	feet	None	None	6	8	12			
		Top Span (Standard Plan) 1/	feet	None	None	10	16	24			
		Manufactured Tank (Vendor) 2/	cu. ft.	1,000	50,000	75,000	150,000	300,000	Consult SCE		
		Water Table Depth Below Bottom	feet	None	> 10	6-10	4-6	< 4			
		Bedrock Depth Below Bottom	feet	None	> 10	6-10	4-6	< 4			
		Stacking Slab (Design):									
		Volume	cu. ft.	None	40,000	180,000	320,000	All			
		Wall Height	feet	None	4	6	8	10			
		Stacking Slab (Standard Plan): 1/									
		Volume	cu. ft.	None	40,000	180,000	320,000	All			
		Wall Height	feet	None	4	6	8	10			
Waste Transfer	634	Pipe Diameter (Gravity)	inches	6	8	10	12	All			
		Pipe Diameter (Pressure)	inches	6	8	10	12	All			
		Concrete Slabs Length or Width	feet	None	30	50	75	150			
		Concrete Wall or Curb Height	feet	None	1	2	3	4			

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				I	II	III	IV	V	INVENTORY & EVALUATION	DESIGN	IMPLEMENTATION
Vegetated Treatment Area	635	Treatment Level	level	None	I	II	III	- - - -			
		Feedlot Area	acres	1	5	10	20	40			
Watering Facility	614	Concrete Stock/Storage Tank (Design)	gallon	750	1,500	3,000	6,000	All			
		Stock/Storage Tank (Pre-approved) 6/	gallon	750	1,500	3,000	6,000	All			
		Used Storage Tank (See NEM 543)	gallon	None	None	10,000	20,000	All			
Water and Sediment Control Basin	638	Fill Height	feet	6	8	10	12	15			
Water spreading	640	Area Served	acre	40	80	160	640	All	Consult SCE		
		Maximum Water Depth	feet	2	3	4	5	All	Consult SCE		
		Maximum Storage	ac-ft	10	20	30	40	All	Consult SCE		
Water Well	642	(see Geology Report or Artesian Well Report – Montana Bureau of Mines (MBMG or State Geologist)							All	- - - -	- - - -
Water Well De-commissioning	351	Depth	feet	25	(Contact Licensed Water Well Contractor)						
Wetland Restoration (see Structure for Water Control for outlet works)	657	Watershed Area	sq. mi.	0.5	2	5	10	20			
		Effective Height (Fill or Ditch Plug)	feet	2	4	6	8	10			
		Storage Volume	ac-ft	1	5	10	20	50			

1/ The term "Standard Plan" refers to designs and drawings that meet Montana NRCS standards and specifications. Standard Plans are reviewed and approved by personnel with the proper Job Approval Authority.
2/ The term "Vendor" refers to a manufactured product developed through Research and Development (R D) with a warranty.
3/ Raw bank height Difference in feet from top of raw bank to the mean still water level.
4/ Wave Protection Height = Sum of the wind setup height plus the wave runup height above the mean still water level.
5/ Inception Drain refers to perimeter drainage around structures to lower the water table.
6/ The term "Pre-approved" refers to a tank that was designed, field tested, or analyzed by personnel with the proper Job Approval Authority or a Registered Professional Engineer.

NOTE: Engineers and technicians shall be aware of the planning requirements for special/large projects as specified in the General Manual, Montana State Supplement, Part 409.3(b)(6).

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