

Montana Engineering Practice Planning and Design Guide for Dam, Diversion

DETERMINE OPERATOR OBJECTIVES

Read and understand the practice standard, Dam, Diversion (348).

Make an appointment with cooperator to see the site and discuss the problems. Be prompt, listen, and ask questions (what are their goals, problems, conservation needs, available resources, existing system characteristics, etc.). Be sure the cooperator understands the need for appropriate permits. Determine water rights and cropping history. Assure that practice requested by landowner is really what is needed to address the resource problem, not just provide what is signed up for through some given program.

Document important information on the NRCS-CPA-6 form in the case file. Complete Environmental and Cultural Assessment, Form 52.

DESIGN PROCESS

1. Watershed Information

- a. Determine size of watershed above structure site.
- b. Determine size of watershed to first downstream confluence, road, bridge, or structure which would have a significant impact on channel and flood flow elevation above this point. This will be used in tail water calculations which could be affected by major inflows from other watersheds or constrictions caused by bridges or culverts.
- c. Calculate peak flows for all significant events up through the 50-year storm event. (See Hydrology general design guide to select method.)
- d. Determine if fish passage capabilities are required.

<u>References</u>	✓
FOTG Section IV	
National Planning Manual 506.10	<input type="checkbox"/> *
NPM 506	<input type="checkbox"/> *
	<input type="checkbox"/> *
	<input type="checkbox"/> *
EFH, Chapter 2	<input type="checkbox"/>
Log Pearson III	<input type="checkbox"/>
TR-20	<input type="checkbox"/>
Flood Magnitude and Frequency	<input type="checkbox"/> *
	<input type="checkbox"/>

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	<u>References</u>	✓
2. Hydraulic Information		
a. Determine design capacity for diverted flow. Based on irrigated acreage, transmission losses, and irrigation efficiency, or measure maximum diverted flow. For water-spreading systems measure flood area, and determine required filling time.	Montana Irrigation Manual	<input type="checkbox"/> *
b. Develop water surface profile for diversion channel (canal) for design capacity. If possible, get survey shots for water surface elevation during maximum diverted flow.	Mannings Equation WSP2 Program	<input type="checkbox"/> * <input type="checkbox"/>
c. Develop dimensions of diversion channel inlet structure and corresponding flow rating curve.	Engineering Field Manual Chapters 3&6. NEH, Section 5 NEH, Section 11	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> *
d. Develop water surface profiles for main channel. Profiles should be run for the Q_2 , Q_5 , Q_{10} , Q_{25} , Q_{50} , and bankfull events. Other pertinent runs maybe needed.	WSP2 program Mannings Equation	<input type="checkbox"/> * <input type="checkbox"/>
e. Determine type of diversion structure (wood, concrete, rock, relocated, etc.) based on cooperators' needs, resources and site conditions.		
f. Develop dimensions of diversion structure, and corresponding rating curve for flows described in (d) above. Include provisions to maintain sediment transport capabilities of stream.	Engineering Field Manual Chapters 3&6.	<input type="checkbox"/> *
g. Finalize design hydraulics of diversion with corresponding hydraulics of channels and out-of-bank flow.	NEH, Section 11	<input type="checkbox"/> *
h. Determine allowable velocities for channels and out-of-bank flow area based on soil type and planned vegetative cover.	Technical Paper No. 61 Technical Release No. 25 WSP2 Program	<input type="checkbox"/> * <input type="checkbox"/> <input type="checkbox"/> *
i. Analyze final water profiles for stability at key flows as described in (c) above. This includes checking reentry flows downstream.		
3. Structural Information		
a. If standard designs are to be used, document the standard drawing number in the design file. Verify that parameters used for standard design are acceptable for this site.		<input type="checkbox"/>

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	<u>References</u>	✓
b. If a unique diversion design, either materially or dimensionally, is developed, all structural analysis must be included in the design file. (This applies to both the diversion and diversion channel inlet structures.)	TR-74 NEH, Section 6 TR-67	<input type="checkbox"/> * <input type="checkbox"/> <input type="checkbox"/>
c. Include fish passage capabilities where needed.		
d. Design rock to control downstream sour.	Far West States, Eng. Design Std. National Hwy. Research Program Report #108 ASAE Paper #91-2055	<input type="checkbox"/> * <input type="checkbox"/> <input type="checkbox"/>
4. Plan Development		
a. Develop drawings to meet minimum criteria established in Montana General Engineering Planning and Design Guide for Engineering Drawings.	EFH-MT Supp. Page 51-15	
b. Assure all permits have been secured.	“A Guide to Stream Permitting in Montana” MACD	<input type="checkbox"/> *

* This activity or documentation is usually required on each job.