



Design Memorandum

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Rapid City Growth
Management Department

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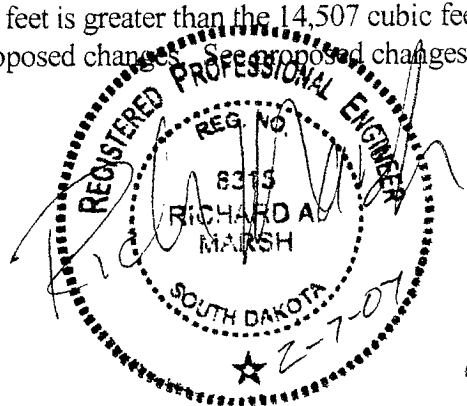
Project: **AIRC Warehouse**

Purpose: This memorandum is an addendum to the drainage report titled "*Drainage Report for AIRC, February 2006*". It summarizes a drainage review of proposed changes to the AIRC Warehouse project. It also lists the necessary improvements needed as a result of the proposed changes.

Background: A drainage report for the above referenced project was submitted in February 2006 as required by the City of Rapid City development process.

Presently, the owner is proposing to add a 2,432 square foot office addition onto the existing warehouse. The office addition is proposed at the same location as the original plan detention pond. Therefore, the detention pond will be moved and will need to be increased in size to account for the increase in impervious area created by the addition.

Findings: The modified rational equation as outlined in chapter 9 of the City of Rapid City Drainage Criteria Manual was used to determine the necessary increase in detention storage. The necessary increase in storage volume is approximately 132 cubic feet. (see attached calculations). The original pond design provided approximately 14,375 cubic feet of storage. The revised pond provides 15,255 cubic feet of storage with 1 foot of freeboard. 15,255 cubic feet is greater than the 14,507 cubic feet required and therefore is sufficient for the proposed changes. See proposed changes on revised plans.



Design Revision to AIFC.

- Added approx. 3300 Ft² (Building + Impervious Area)

Is there necessary increase in retention storage?

Use 100 YR storm for Storage Volume

Existing $Q_p = CIA$ $C = 0.4$ - hills = 1 clay, etc.
 $T_c = \leq 5 \text{ min}$ so use 5 min.
 $I_{100} = 9.48 \text{ in.}$
 $A = 3300 \text{ Ft}^2 = 0.076 \text{ Ac.}$

Existing $Q_{0.2} = (0.4)(9.48)(0.076) = \underline{0.29 \text{ CFS}} = Q_0$

Developed 100 Yr $C \rightarrow 0.9$ Use modified Rational to determine increase in storage volume.

Peak flow at time int.

5 min $Q_p = (0.9)(9.48)(0.076) = 0.65 \text{ CFS.}$
 10 min $Q_p = (0.9)(7.5)(0.076) = 0.51 \text{ CFS.}$
 15 min $Q_p = (0.9)(6.23)(0.076) = 0.43 \text{ CFS.}$
 25 min $Q_p = (0.9)(5.39)(0.076) = 0.37 \text{ CFS.}$

Determine Critical Volume. $V_s = 60 \left(\frac{D}{\text{time duration (min)}} \right) (Q_p - Q_0)$ - Eqn 9.5 RCDEM

$V_{s5} = 60(5)(0.65 - 0.29) = 108 \text{ Ft}^3$
 $V_{s10} = 60(10)(0.51 - 0.29) = 132 \text{ Ft}^3 \leftarrow \text{Critical Volume.}$
 $V_{s15} = 60(15)(0.43 - 0.29) = 126 \text{ Ft}^3$
 $V_{s25} = 60(25)(0.37 - 0.29) = 96 \text{ Ft}^3$

Increase in Storage Volume must be 132 Ft³

