FLOOD RISK MANAGEMENT GUIDELINES FOR LOCATION OF NEW FACILITIES FUNDED BY ALBERTA INFRASTRUCTURE

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for
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Introduction

The province of Alberta has a large investment in owned, funded and leased public service buildings and spaces. The occupancies accommodated in the buildings, as classified under the Alberta Building Code, include assembly, care, detention, residential, office, retail and industrial uses.

In recent years there has been an increase in the frequency and severity of extreme weather conditions indicating a need for closely examining the process and considerations when selecting sites for new buildings or when undertaking additions or upgrades to existing facilities already in flood prone areas.

The guidelines presented here have been prepared for selecting sites for buildings funded in whole or in part by Alberta Infrastructure. The guidelines also apply in the consideration of leasing complete or partial non-owned facilities.

In July 2000 a Discussion Paper entitled "Flood Risk Management with Respect to Location of New Facilities Funded by the Province of Alberta" was published by the Civil Projects Branch of the Transportation and Civil Engineering Division of Alberta Infrastructure[1]. This Discussion Paper presented several items for consideration in locating future provincial government owned and funded buildings, which are reflected in the guidelines presented herein.

The guidelines are not standards or rigid requirements as it is extremely difficult to set specific criteria for site selection. Following the guidelines will not necessarily guarantee or avoid damage to a building in the event of a flood. Sometimes weather conditions combined with geographical features result in short warning times and unexpected events. However, if the recommended provisions are followed and a flood occurs, damage to the building may not be as great as it otherwise might have been if locational precautions were ignored. The precautions taken should reduce the damage and should enable the building to be restored quickly.

The word "flood", as defined in the Oxford dictionary, and as used in these guidelines, means an overflowing or influx of water beyond its normal confines.

Site Selection

Regardless of occupancy or function, the preferred location for a building should be on a site which is not vulnerable to flooding.

Recognizing that flood-free sites are not always available in every region, a guide to selecting a site is provided, based on the principle that buildings accommodating certain uses and occupancies should be located on sites that are less vulnerable to flood damage than others. Examples of typical structures, which might be identified as representative of certain classifications, are provided in Table A.

Lifeline structures are those of critical importance that provide vital services in saving and avoiding loss of human life and which must be able to function during an emergency. They are also structures which accommodate and support activities that would be important to rescue and treatment operations, to maintenance of public order, to ongoing housing of substantial populations, and to confinement of activities which, if disturbed or damaged, could be hazardous to the region.

Facilities not considered to be in the lifeline category but for which locational conditions must be considered are also shown in Table A. In addition, for those facilities containing hazardous products, or which accommodate activities that produce or process hazardous products, it is important to protect or confine the contents and operations from potential damage by floods. They are shown in the Table under Other Facilities as Class 6 (non-lifeline) with a preferred design flood elevation as high as for the Class 1 and 2 facilities. The same is also true for facilities containing artifacts and historical documents (Class 7) which would be impossible to replace if lost or damaged by flood events.

Facilities should be located and designed so that they can withstand water levels that are 0.5 m above the design flood elevations.

Campgrounds, parks, surface parking, playgrounds, rest stops, picnic areas and similar developments are sometimes located on sites below the 1:100 Design Flood Level. (NOTE: This is defined as the flood level with a 1 in 100 probability of being exceeded in any given year. Similarly for 1:500 and 1:1000 flood levels referred to elsewhere in this document.) Because of their short term use, permission may be granted for new developments of this nature at these lower levels. However, support facilities associated with such uses, including washrooms, toilets, laundry buildings and cooking shelters should be located above the 1:100 design flood level. All developments of this nature should be discussed with Alberta Infrastructure prior to proceeding with design.

Recommendation 9, presented in the report entitled "Flood Risk Management Action Plan for Alberta" prepared by the Flood Risk Management Committee[2] is used as a guide to determine the minimum preferred water elevation (the design flood levels) for protection of facilities.

Existing or new flood-proofed areas or flood plains protected by dykes, floodways or other means are not considered as acceptable sites for new government owned, funded or leased buildings.

To determine if a potential site for a proposed building is in a flood risk area within a given municipality, a flood risk map may be available from the municipality or from Alberta Environment and Parks at http://aep.alberta.ca/water/programs-and-services/flood-hazard-identification-program/default.aspx. At this time, flood mapping and mitigation measures are not available for all municipalities. In some cases a separate study may be required to establish the design flood elevations before proceeding with a facility design or construction.

Alberta Environment and Parks also have reports on 1:500 year and 1:1000 year Design Flood Levels for some municipalities. Contact AEP.Flood@gov.ab.ca or call 780-427-6280.

The Design Flood Levels reflect the priority of protection from severe flooding on the following basis, assuming that flooding would damage the facility or its contents:

I
- 0.1 percent (1:1000 year return period) flood level:
  - For vital lifeline facilities critical to the rescue and treatment of the injured which must be able to function during an emergency.
  - For vital lifeline facilities critical to maintaining patient accommodation, care and treatment and to avoid the need to relocate occupants in the event of threatening floods.
  - For non-lifeline facilities housing irreplaceable items or accommodating activities of a nature hazardous to human life or the environment if not contained.

II
- 0.2 percent (1:500 year return period) flood level:
  - For other lifeline facilities critical to the maintenance of public order and welfare, to housing of substantial populations and to the orderly return to social and economic welfare.

III
- 1.0 percent (1:100 year return period) flood level:
  - For the remaining facilities (non-lifeline) to identify a minimum design flood level.

In exceptional cases, for facilities for which adequate locational benefits and means to provide an equivalent alternative method of protection (including adequate warning) can be displayed, consideration will be given to locations lower than the design flood level indicated.

Existing Facilities

Before undertaking an addition to, or renovations, upgrading or retrofitting of, an existing facility located in a flood risk area, the viability of the project should be assessed. Questions that should be examined include:

- In what classification does the building fall?
- To what flood level hazard is the building exposed?
- Is the building located in a flood proofed area? (Reference municipality or Alberta Environment and Parks)
- Is the building itself flood proofed to a higher Design Flood Level than the site on which it is located? (Reference Alberta Infrastructure)

In some cases, sites have been “flood proofed” to protect buildings or areas from floods. This could be a measure taken to provide an area with a certain level of protection from flooding and on which new building construction was permitted by local jurisdictions. It might also have been a remedial measure taken after a building (or an area containing several buildings) was unexpectedly damaged by a flood. Flood proofing might have taken the form of dykes constructed around all or part of a site, by building up the grade for a building site, by diverting water courses or by taking other similar precautions to protect a building from floods.

Based on the existing conditions, the cost of the new work and the extent of flood proofing which may be required, a cost benefit analysis should be prepared to compare the cost of proceeding with the work on the existing site to the cost of alternative acceptable solutions, including building a new facility on a less vulnerable site.

No Option Alternatives

In some communities it may be impossible to find a suitable site at the preferred elevation for a proposed facility. In the event this situation occurs, and location of the facility in another region or community is not an option, solutions for relaxation of the preferred level, such as proposals for flood-proofing, should be presented to Alberta Infrastructure for consideration.

Conclusion

Each proposed site for a new building must be assessed to determine its appropriateness for the intended use and occupancy of the building. Ideally, every facility would be located on a site above the highest design flood level. Realistically this condition is not always available, so, in addition to the usual considerations of zoning, orientation, planning, access, utilities, services, code requirements, etc., its exposure to possible damage by flood events must also be examined.

A summary is available of preferred design flood levels for new Alberta Infrastructure owned and funded buildings and for considering existing facilities for potential purchase or lease. It should be viewed as a starting point when assessing a site. Before finalizing the selection, a detailed consideration of the building use, occupancy and the impacts of flooding should be applied. If the activities to be accommodated are not evident from initial programming information, discussions should be held with Alberta Infrastructure to assign the proper design flood level.

Determination of the classification within which a building should be placed is not always evident from a generic name or description. For example, a warehouse, in Class 8 of the Table, would normally be acceptable for location in an area with a Design Flood Level of 1:100. However, if it is used to store hazardous products a more stringent classification would be warranted, and should be discussed with Alberta Infrastructure.

Another example may be found in a post-secondary facility, in Class 4 of the Table, in which a research laboratory, albeit a relatively small component, may accommodate activities which could be damaged by flood events exceeding the 1:500 design flood level. The consequences of flooding might include the release of dangerous toxic or explosive contents hazardous to the environment or human life.

Regardless of the category within which a building is classified and where the design flood level has been set, its design should be approached with sensitivity for the critical features or components which might be affected or damaged by a flood. In many cases minor changes involving little or no additional cost to the construction of a building could significantly improve its protection against damage. For example, equipment critical to the operation of a building could be relocated from a lower floor level to a higher one or might be raised on a platform to avoid damage. When the location of critical equipment is being established, a common sense consideration of the impact on the use and operation of a building is always worthwhile.

Consultation with Alberta Infrastructure and, if possible, the ultimate occupants of the facility, is invaluable in selecting a safe site and avoiding costly future remedial work for facility repairs or replacement resulting from flood damage.

TABLE A – FACILITY CLASSIFICATION AND PREFERRED DESIGN FLOOD ELEVATION LEVELS FOR ALBERTA INFRASTRUCTURE OWNED AND FUNDED NEW FACILITIES *

Decreasing consequence assuming adequate warning ↓

	CLASS	IMPORTANCE OF AVOIDING MAJOR DAMAGE DURING A FLOOD EMERGENCY	DESIGN FLOOD LEVEL	EXAMPLES OF FACILITIES	COMMENTS
Lifeline facilities	1	Critical to the ability to save and avoid loss of human life.	1:1000	Legislative buildings Communication centres	Including computing centres
	2	Critical to the ability to rescue and treat the injured and to prevent secondary hazards.	1:1000	Hospitals and medical facilities Extended care facilities	Including ancillary facilities such as power plants, service and maintenance facilities
	3	Critical urban linkages important to the maintenance of public order and welfare.	1:500	Courthouses Provincial Buildings	Serve as government centres for communication in event of emergency
	4	Critical to the ongoing housing of substantial populations.	1:500	Schools Post-secondary educational facilities Seniors Residences High-rise buildings Correctional facilities Rehabilitation treatment centres	Schools and post-secondary educational facilities may be required to serve as emergency relief centres.
	5	Critical to the orderly return to long term social and economic welfare.	1:500	Airports	Critical for access for supplies and support.
Other facilities	6	Important to the ability to avoid endangering human life and environment.	1:1000	Hazardous waste disposal and treatment facilities High risk research facilities	
	7	Important to retention of documented historical data and artifacts.	1:1000	Museums, archives, cultural centres	
	8	Important to provide threshold level of protection.	1:100	Offices Retail facilities Warehouse Service & maintenance Parking Other	Other than those associated with facilities in the higher Design Flood Level categories See comments under Site Selection for short-term use facilities.

* Water and Wastewater Facilities are not included in Table A. Contact Alberta Environment and Parks for guidelines, related to the location of Water and Wastewater Facilities.

Bibliography

1. Flood Risk Management With Respect To Location Of New Facilities Funded By The Province Of Alberta, A Discussion Paper. Civil Projects Branch, Transportation and Civil Engineering Division, Alberta Infrastructure.
   July 2000

2. Flood Risk Management Action Plan For Alberta. Draft Action Plan. Prepared by: Flood Risk Management Committee. 2001
   ISBN-07785-1381-1, Publication Number I/859

Documents are available from:

- Alberta Infrastructure
  Health and Government Facilities Division
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  Edmonton, Alberta T6H 5V7

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