

## **APPENDIX Q**

**Excerpts from 2006  
Comprehensive Code Review  
Related to the Administration Building**

Confidential

# Comprehensive Code Review

*South End Water Pollution Control Centre*

Submitted to: The City of Winnipeg  
October 26, 2006



**CH2MHILL**

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# WINNIPEG SOUTH END WATER POLLUTION CONTROL CENTRE

## 1.0 Introduction

### 1.1 Background

The Risk and Criticality reports prepared by CH2M HILL / RVA recommended that a comprehensive code assessment be undertaken relating to life and fire safety. The assessment included a review of the requirements of the Manitoba Building Code; the Canadian Gas Code (B-105); the Canadian Electrical Code; and NFPA 820 - the Standard for Fire Protection in Wastewater Treatment and Collection Facilities. It should be noted that the code review was carried out for the NEWPCC and the SEWPCC by the CH2M HILL / SNC Lavalin team. EarthTech was assigned the work for the WEWPCC.

A pre-screening was undertaken early in the project and it was found that there were a significant number of items in non-conformance to current codes. A recommendation was made to the Steering Committee that a detailed Code review be undertaken to better determine the full extent of non-conformance and to establish a consistent baseline of information. This baseline can be used for purposes of the Reliability Upgrades project as well as all other capital projects contemplated at the NEWPCC and SEWPCC.

### 1.2 Code Application

The terms of reference for this review required that the review use the most current version of the codes in effect at this time. In reviewing the facilities we have applied the Building Code, Gas Code and NFPA820 literally. We have avoided applying any equivalencies that are not accepted by authorities having jurisdiction.

#### 1.2.1 Manitoba Building Code

Building codes have changed significantly in many subject areas over the years. Most code changes have made the current versions of the code more restrictive than previous versions. An example is that the current requirement for handrail height is approximately 50 mm higher than what was required 30 years ago. This affects nearly all handrails in the facilities. Another pertinent example is that in 1990 it was possible to construct an F-2 (Medium Hazard) Industrial occupancy three times the size permitted today, before having to install automatic sprinklers. These, and many other code changes over the years, are the major cause of most of the non-conformance issues.

When addressing non-conformance issues we must realize that the building code is not a retroactive document requiring upgrading of building components to meet current standards. If an item, which can now be categorized as non-conforming, met the code requirements when it was constructed, it can be considered as "grandfathered".

#### 1.2.2 B105 Gas Code

This code applies to newly constructed wastewater treatment plants as well as additions to and upgrading of existing facilities. It also applies to existing digester gas systems where, in the opinion of the Authority Having Jurisdiction, a hazard or potential hazard exists.

The SEWPCC was built prior to adopting the current version of the Gas Code. The Boiler Room may have met the code requirements in effect at that time.

It is our experience that the code is literally adhered to by the Authorities Having Jurisdiction. When new additions to an existing digester gas system are constructed the authorities will review the existing system for conformance and require that the existing system be upgraded to meet code. It is unlikely variances to the code will be allowed.

### **1.2.3 NFPA 820**

The Use of NFPA as a risk assessment tool is described in detail on the attached Technical Memorandum No. 1 dated November 16, 2005.

## **1.3 MBC Use and Occupancy**

The vast majority of the facilities are considered to be of an Industrial usage and are designated as Group F occupancy. In the MBC Group F is further divided into three sub-groups as follows:

Group F-1 High Hazard

Group F-2 Medium Hazard

Group F-3 Low Hazard

Once the appropriate use and occupancy sub-group is determined it is then possible to determine the appropriate building size, height, construction, and fire protection requirements.

The definitions for Medium and Low Hazard occupancies supplied by the MBC do not clearly address the potential fire loads within the facilities. The approach we have taken is to consider any area that may require CEC classification to be an F-2 occupancy. For other areas where it is not possible to use the MBC industrial definitions, we have adopted the principle that the occupancy is Medium Hazard by default unless it can be reasonably shown to be Low Hazard. Although this approach is not mentioned by the MBC or other Canadian codes, it is adopted by most US codes and we feel this approach is reasonable.

When applying the building requirements we found only a few instances where we felt it was necessary to rely on the "Special and Unusual" designation. An example would be a building containing a significant proportion of open tankage, such as the clarifiers. In this instance it is unreasonable to consider the open tankage to be building area when determining allowable size.

## **1.4 Review Methodology**

Review and documentation of the non-conformance items was performed in the following manner:

1. Review of existing structures and configurations - floor areas, building heights, use and occupancy.
2. Identification of individual buildings based on MBC definitions.

## 1.5 Category Breakdown

The items in non-conformance to the Manitoba Building Code have been segregated into four categories as follows. In some cases an item falls into two categories (e.g. 1 & 4).

### Category 1

These are items that were likely in non-conformance to the Codes even at the time of construction or have been modified since the occupancy permit was received. It is recommended that these items be mitigated to restore the original Code intent.

### Category 2

These are items that are in non-conformance, but due to physical constraints, it would be virtually impossible to mitigate. In presenting these items, the prevailing condition (category 3 or category 4) is also noted (e.g. 2(3)).

### Category 3

These are items that are in non-conformance to the current Codes but were likely in conformance to the Code at the time of construction. These items are "grandfathered" until such time as an alteration, reconstruction, demolition, removal or relocation of a building is contemplated. The Authority Having Jurisdiction will decide the extent to which items must be upgraded to current Codes, if at all.

### Category 4

These are items that were likely in non-conformance to the Codes at the time of construction, but must have been accepted by the Authority Having Jurisdiction as an occupancy permit was issued. As with Category 3 items, the extent to which these items must be upgraded, if at all, would be decided by the Authority Having Jurisdiction.

The MBC has different allowable exiting travel distances depending on whether the building is sprinklered or not sprinklered. MBC 3.4.2.5.(1)(f) allows a maximum 30 m travel distance to the nearest exit if the building is unsprinklered, and MBC 3.4.2.5.(1)(c) allows a maximum 45 m travel distance to the nearest exit if the building is sprinklered. Although the Plant has numerous exit stairs, there are three exits (Pump Room West Exit Stair; Plant Services area at the N-W corner of the Boiler Room; Unox/Sludge Thickening area west of the Sludge Truck Bay) which do not lead to the exterior of the building and therefore cannot be considered to be conforming exits. The exiting and travel distance requirements of the Code must be applied as if these stairs are normal access stairs and not exit stairs.

If the maximum 30 m travel distance requirement is applied based on the building being unsprinklered then all areas of the Plant are non-conforming to the travel distance requirements. There are significant portions of the Plant, in all areas and at all levels, where the travel distance to an exit exceeds 30 m. The entire Plant is non-conforming to the maximum 30 m travel distance requirement.

If the maximum 45 m travel distance requirement is applied based on the building being sprinklered, the only areas that meet this requirement are the Secondary Clarifiers 1, 2, 3 and the Unox/Sludge Thickening area. Any area east of the connection between the Unox area and the Aeration Tanks is non-conforming to the maximum 45 m travel distance requirement.

There are other situations that are non-conforming when viewing the entire plant as a single building.

LOCATION:	NON-CONFORMANCE ITEMS	R#	MBC Ref.
Basement Areas	Fire compartments exceed 600 m <sup>2</sup> in unsprinklered basements. The basements of the Pump and Screen Area, Primary Clarifiers and Aeration Area, and Secondary Clarifier Area all exceed 600 m <sup>2</sup> .	6	3.2.1.5.(1)
Basement Galleries	Underground walkways exceed 100 m length between smoke barriers.	8	3.2.3.20.(4)(a)
Entire Building	Fire alarm system not provided for building that requires sprinklers.	10	3.2.4.1.(1)
	Standpipe system is not installed in unsprinklered building.	11	3.2.4.2.(3)
	Emergency lighting is missing in many areas.	13	3.2.5.8.(1)(c)
	In many areas exits are not clearly visible.	15	3.2.7.3.(1)
	Lack of exit signs indicating direction of egress.	37	3.4.2.5.(3)
		52	3.4.5.1.(5)
All Exits	Smoke detectors not installed in exit stairs.	12	3.2.4.11.(1)(e)

**Administration Area:**

In accordance with the Code Summary requirements, specific Rooms or areas that require fire separations are as follows:

1 hr	All levels South Stair 116, including Link 114
1 hr	All levels North Stair 115
1 hr	Basement – Janitor Room M107
1 hr	Basement – HVAC Room M118

**Summary of Observed Non-conformance Characteristics – Administration area:**

LOCATION:	NON-CONFORMANCE ITEMS	R#	MBC Ref.
Administration Area	Entire administration area is not Barrier Free accessible	93	3.8.1
Stair 116	Restricted headroom of 1930 mm at the mid landing	45	3.4.3.4.(1)
	Stair riser height of 190 mm	75	3.4.6.7.(2)
	Guard height of 850 mm at stairs	67	3.4.6.5.(2)
	Handrail height of 850 mm at stairs	60	3.4.6.4.(4)
	Penetrations of service lines and vent duct	49	3.4.4.4.(1)
	Non-conforming opening sizes at guards	69	3.4.6.5.(5)
Stair 115	Stair riser height of 190 mm	75	3.4.6.7.(2)
	Guard heights of 870 mm at stairs and 1000 mm at landings	67	3.4.6.5.(2)
All Stairs	At least one handrail does not extend 300 mm horizontally at top and/or bottom of stair.	63	3.4.6.4.(7)
Doors	Refer to Door, Frame and Hardware Summary on next page.		

Door, Frame and Hardware Summary - Administration Area:

DOOR No.	LOCATION	REQD FR	NON-CONFORMANCE ITEMS
B-05A	Hall to 116	3/4 hr	Conforms
??	Link to 113	3/4 hr	3, 4
D-120	Hall to 115	3/4 hr	Conforms
D-101B	101 to 115	3/4 hr	3, 4
DM118	Hall to M118	3/4 hr	Conforms
DM107	Hall to M107	3/4 hr	3, 4, 8a, 10
DM148	Hall to M148	3/4 hr	Conforms

Non-conformance items:

- |     |   |                 |
|-----|---|-----------------|
| 3.  | Door in fire separation requires rated closure - no label or inadequate rating  | 3.1.8.1.(2)     |
| 4.  | Frame in fire separation requires rated closure - no label or inadequate rating | 3.1.8.1.(2)     |
| 8a. | Door in fire separation requires closer - closer missing or inoperable          | 3.4.6.12.(1)(a) |
| 10. | Fire separation requires rated closure - louver without damper installed        | 3.1.8.1.(2)     |



### 3.0 SEWPCC - Canadian Electrical Code and NFPA-820 Code Non-Conformance Review

#### 3.1 Introduction

This section tabulates the non-conformance issues identified with respect to the requirements of the Canadian Electrical Code and NFPA-820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities. The organization and order of this section has been kept in the same order as the MBC section.

NFPA-820 establishes requirements based on the type of wastewater treatment process and the hazards associated with that process. Its requirements differ from Building Code requirements as NFPA-820 makes no distinction as to building size or height, except to recognize increased hazards associated with below grade installations.

Where reference is made to a specific clause in NFPA-820 (i.e. NFPA x.x.x.x), refer to Appendix D for a brief summary of the Code requirements, evaluation of the impact, and possible mitigation measures. Each issue is identified with an "R#" which is consistent between the Non-Conformance summary in the report and the Failure Impact commentary in Appendix D.

#### 3.2 Main Plant Building

##### Administration Area:

LOCATION	CODE REFERENCE	VENT REQ'D	ELEC CLASS	MEETS
Offices, Staff Facilities,	NFPA		UC	Yes
Washrooms, Lockerrooms	CEC		Non-Hazardous	Yes
	NFPA 1.1.3		NA	No

##### Summary of Observed Non-conformance Characteristics - Administration area:

LOCATION:	NON-CONFORMANCE ITEMS	R#	NFPA Ref.
Connection to process areas	Administration area not physically separated from process areas.	1	1.1.3

##### Pump, Screen and Grit Area:

LOCATION	CODE REFERENCE	VENT REQ'D	ELEC CLASS	MEETS
Wet Well	NFPA 4.2.34.(b)	min 12 ACH	Div 2	No
	NFPA 4.2.34.(a)	< 12 ACH	Div 1	No
	CEC		Div 2	No
Wet Well Vestibule	NFPA 4.2.34.(b)	< 12 ACH	Div 1	No
G125	CEC		Non-Hazardous	Yes

49	3.4.4.4.(1)	<p><b>Requirement:</b> Exit integrity – no openings or penetrations allowed except for doorways and services serving the exit.</p>																												
		<p><b>Observed non-conformance issue(s):</b> There are many instances of non-acceptable penetrations through exits – pipes, conduits, electrical wires, ductwork, louvers.</p>																												
		<p><b>Comment:</b> These penetrations have the potential of compromising the safety of the exit enclosure. The code is quite explicit in requiring the integrity of exit enclosures.</p>																												
		<p><b>Failure Impact:</b></p> <table border="0"> <tr> <td>Health and Safety of employees and public</td> <td>(1.0)</td> <td>X = 10</td> <td>10.0</td> </tr> <tr> <td>Compliance</td> <td>(0.8)</td> <td>X = 10</td> <td>8.0</td> </tr> <tr> <td>Health and Safety</td> <td>(0.8)</td> <td>C = 7</td> <td>5.6</td> </tr> <tr> <td>Public Image</td> <td>(0.6)</td> <td>C = 7</td> <td>4.2</td> </tr> <tr> <td>Repair Severity</td> <td>(0.2)</td> <td>L = 2</td> <td>0.4</td> </tr> <tr> <td>Financial Impact</td> <td>(0.2)</td> <td>M = 3</td> <td>0.6</td> </tr> <tr> <td><b>OVERALL RATING:</b></td> <td></td> <td></td> <td><b>28.8</b></td> </tr> </table>	Health and Safety of employees and public	(1.0)	X = 10	10.0	Compliance	(0.8)	X = 10	8.0	Health and Safety	(0.8)	C = 7	5.6	Public Image	(0.6)	C = 7	4.2	Repair Severity	(0.2)	L = 2	0.4	Financial Impact	(0.2)	M = 3	0.6	<b>OVERALL RATING:</b>			<b>28.8</b>
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		<p><b>Mitigation:</b> Remove penetrations, louvers, access panels, etc. that compromise the exit integrity.</p>																												

## Appendix D

### SEWPCC Non-Conformance Failure Impact - CEC/NFP-A820

This Appendix deals with the potential Failure Impact of Canadian Electrical Code and NFPA-820 non-conformances issues. Refer to Appendix A for more detailed description of non-conformance impact ratings.

NON-CONFORMANCE IMPACT RATINGS:

N	= 1	Negligible
L	= 2	Low
M	= 3	Moderate
C	= 7	Critical
X	=10	Catastrophic

	CODE REF:	DESCRIPTION:																												
1	NFPA-820 1.1.3 & 3.3.67.2	<p><u>Requirement:</u> The code indicates that it does not apply to "... (7) Separate non-process related structures (see 3.3.67.2)." Clause 3.3.67.2 defines a separate structure as "A structure that is physically separated and does not contain any process-related equipment associated with the collection and treatment of wastewater and solids derived from wastewater treatment processes."</p> <hr/> <p><u>Observed non-conformance issue(s):</u> Several non-process areas are physically connected to process areas. They include the Administration area and the Standby Power building.</p> <hr/> <p><u>Comment:</u> There is a low fire and explosion hazard from potential migration of gases into areas that are not totally separated as per the code definition.</p> <hr/> <p><u>Failure Impact:</u></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Health and Safety of employees and public</td> <td style="padding-left: 20px;">(1.0)</td> <td style="padding-left: 20px;">L = 2</td> <td style="padding-left: 20px;">2.0</td> </tr> <tr> <td style="padding-left: 20px;">Compliance</td> <td style="padding-left: 20px;">(0.8)</td> <td style="padding-left: 20px;">L = 2</td> <td style="padding-left: 20px;">1.6</td> </tr> <tr> <td style="padding-left: 20px;">Health and Safety</td> <td style="padding-left: 20px;">(0.8)</td> <td style="padding-left: 20px;">L = 2</td> <td style="padding-left: 20px;">1.6</td> </tr> <tr> <td style="padding-left: 20px;">Public Image</td> <td style="padding-left: 20px;">(0.6)</td> <td style="padding-left: 20px;">M = 3</td> <td style="padding-left: 20px;">1.8</td> </tr> <tr> <td style="padding-left: 20px;">Repair Severity</td> <td style="padding-left: 20px;">(0.2)</td> <td style="padding-left: 20px;">L = 2</td> <td style="padding-left: 20px;">0.4</td> </tr> <tr> <td style="padding-left: 20px;">Financial Impact</td> <td style="padding-left: 20px;">(0.2)</td> <td style="padding-left: 20px;">L = 2</td> <td style="padding-left: 20px;">0.4</td> </tr> <tr> <td colspan="3"><b>OVERALL RATING:</b></td> <td style="text-align: right;"><b>7.8</b></td> </tr> </table> <hr/> <p><u>Mitigation:</u> Provide weather-stripping at connecting doors and ensure doors are kept closed. Pressurize connecting spaces to prevent migration of gases.</p>	Health and Safety of employees and public	(1.0)	L = 2	2.0	Compliance	(0.8)	L = 2	1.6	Health and Safety	(0.8)	L = 2	1.6	Public Image	(0.6)	M = 3	1.8	Repair Severity	(0.2)	L = 2	0.4	Financial Impact	(0.2)	L = 2	0.4	<b>OVERALL RATING:</b>			<b>7.8</b>
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