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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

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Title - Sujet General Purpose Bldg-N.B./N.S.	
Solicitation No. - N° de l'invitation EC016-123090/A	**Amendment No. - N° modif.** 001
Client Reference No. - N° de référence du client R.043958.001	**Date** 2012-03-15
GETS Reference No. - N° de référence de SEAG PW-$PWB-007-3063	
File No. - N° de dossier PWB-1-34209 (007)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2012-04-19**	**Time Zone** **Fuseau horaire** Atlantic Daylight Saving Time ADT
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☐ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Ellis-Herring , Alison PWB	**Buyer Id - Id de l'acheteur** pwb007
Telephone No. - N° de téléphone (506) 636-3908 ( )	**FAX No. - N° de FAX** (506) 636-4376
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:**	

Instructions: See Herein

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Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) **Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)** **Signature** **Date**	

Canada

This Solicitation Amendment Number One (1) is raised to include the following addendum.

The following Addendum to the tender documents is effective immediately. This Addendum shall form part of the contract documents.

All other terms and conditions remain the same.

Addendum No. 1

REQUEST FOR PROPOSAL DOCUMENT

Delete all references to Project Manual **and replace with** Terms of Reference.

TECHNICAL CONSIDERATIONS - GO AND GI PROJECTS

Remove ATT8 **and replace with** attached "Technical Considerations GO and GI Projects" Document which is referenced in the Terms of Reference, Clause 1.8.1 Documents available to Proponents in English only.

Correctional Service Canada | Service correctionnel Canada

SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations
GO AND GI PROJECTS

Canada

TABLE OF CONTENTS

Correctional Service Canada | Service correctionnel Canada

SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations

GO AND GI PROJECTS

SECTION G - GENERAL

Canada

TABLE OF CONTENTS

G-1 GENERAL - INTRODUCTION

1. PURPOSE

1.1 This document has been developed in order to provide:

1.1.1 Site, building performance and design guidelines which are specific to the needs of correctional facilities, and which supplement existing applicable codes and authorities. This document is to be used for the development of all CSC institutional design and construction projects. Women's institutions use separate standards[1] as do Community Correctional Centres[2];

1.1.2 Supplementary technical data, which augments the "Accommodation Guidelines", documents.

2. CONTENT

The information contained in this document generally identifies performance specifications. In a number of instances, detailed solutions are identified which have proven to be successful and which allow easy conversion into contract documentation.

3. APPLICATION

3.1 For new construction, adherence to the documented solutions is considered important. Deviations, however, will be considered providing equal performance can be demonstrated. In such cases, requests shall be submitted to the issuing authority, the Director Facility Planning and Standards.

3.2 For renovations, alterations and expansions of existing buildings and systems, conformity to this document may not always be practicable or cost effective due to existing physical features and the age of the facility. In such cases, information contained in this document should be used as guidelines and alternate solutions, with appropriate justification, shall be submitted to the issuing authority.

4. UPDATING

4.1 In order to keep the document current, Technical Criteria sections are periodically and systematically updated; in addition, as observations and new information are made available to the issuing authority, the Technical Criteria Document is reviewed to determine the need for amendments.

5. DOCUMENT DISTRIBUTION

5.1 The document in its final revised version is distributed in a loose-leaf format to allow replacement of amended pages between final revised versions.

5.2 Distribution of the Technical Criteria Document and amendments will be made to the listed recipients. Recipients are responsible for broader distribution and for subsequent updating.

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1 Correctional Service Canada – Facility Standards: Women's Institutions, October 2004

2 Correctional Service Canada – Facility Guidelines: Community Correctional Centres

5.3 The office of Director Facility Planning and Standards at NHQ is responsible for issuing the Technical Criteria Document in both official languages.

6. SECURITY REQUIREMENTS FOR CONSTRUCTION

Security requirements, which are critical for construction within occupied institutions, have been established to satisfy the special needs of CSC. Contractors performing construction in operating institutions must conform to the provisions contained in the "Security Requirements" issued by the office of Director Facility Planning and Standards. This document will form part of the specification of the contract documents for works to be undertaken.

7. SECURITY CLASSIFICATION

In order to provide a general understanding of the security classifications of correctional institutions, the following brief definitions are included. While CSC uses the minimum, medium, maximum etc. designations under the following headers (institution types) to classify their institutions[3], there exists another designation (S-X) which describes the types of housing units found at CSC. Because institutions and expansions have been built over time and since the influencing factors may have differed from time to time, there exists an array of unit types. CSC has classed these housing units by an S category ranging from S-2 to S-7, with more security in ascending order. S-1 refers to Community Correction Centers, which are not described in this document. S-2 housing matches the minimum designation but may also be found at mediums, S-3 to S-5 match the medium designation, and S-6 and S-7 are at maximum. Multi-level institutions have units at the S-4 and S-5 level but may have added features to address their special purpose. An S designation for housing at a Special Handling Unit has been omitted given the unlikely need for additional capacity at that level. Here is a description of each category:

7.1 Minimum security institutions (S-2)

Minimum security institutions do not have a defined and fenced perimeter. Internal security is low key with only one 24 hour post referred to as the duty post to which all visitors report to. All buildings are constructed to commercial standards and are free egress. Approximately 15% of CSC beds are located at minimums.

S-2: Housing units resemble apartments, attached or detached houses with each unit housing a maximum of 10 inmates but more typically 5-8, eight being most common. Houses/apartments provide for a shared living experience and are free egress in accordance with residential occupancy of the NBC. Ease of detection and alarms warn of unauthorized egress after hours.

7.2 Medium security institutions (S-3, S-4 & S-5)

Medium security institutions have a double fence perimeter with intrusion detection systems and cameras. Several old institutions still have walls with detection capability. Armed vehicles conduct patrols on the exterior side of the perimeter. Entry into the institution is highly controlled and guarded. Arms are kept only at the perimeter. On the interior, movement and activity areas are moderately controlled. Buildings are generally

[3] Following Commissioner's Directive #706 of March 15, 2010

constructed of harder materials, some having impeded egress. Housing units vary in the degree of security and supervision. Activities are zoned by time of use and fences may separate the zones. Approximately 58% of CSC beds are located at mediums.

S-3: Housing units which provide for a similar living experience as S-2 but where the envelope of each apartment/suite is secured. A number of apartments make up the unit which is supervised by an officer in an open control post. This post allows for the control of traffic to and from the suites but there are no views of the interior of the suites from the location of the control post. A separate office suite is combined with the unit. This type of unit provides for containment at the apartment level but does not secure inmates within the apartment.

S-4: Housing units which are based on the cell block approach but where the ranges are more open to permit better views and encourage interaction. Several ranges make up the unit surrounding a common core but with no physical separation to allow free movement. An open control post is located in the core positioned optimally for sight and sound. The post controls access to cells. A separate office suite is combined with the unit. This type of unit provides for containment at the cell level.

S-5: While the S-3 and S-4 medium categories are quite distinct, this housing unit category has a broad collection of unit types and features. As it represents the most secure unit at the medium, the features aim to either control the group sizes or offer a protected control post or may have both of these features. Because the control posts are enclosed with security glass, sound of surrounding area is deadened. A separate office suite is combined with the unit. This type of unit provides for containment at the cell level and in most cases at the range level.

7.3 Maximum security institutions (S-6 & S-7)

Maximum security institutions have perimeters and access points similar to mediums. Arms however are kept not only at the perimeter but also in the interior. Conveyance of arms is highly controlled via tunnels and galleries which connect control posts at key areas. Armed intervention is possible to circulation areas as well as many activity areas from a Control post or gallery. Buildings and activity zones are packed close together or buildings may be interconnected. Due to the incompatibility of many inmates, activities and movement are scheduled and highly controlled. Approximately 15% of CSC beds are located at maximums.

S-6: Housing units at this level are intended to test inmate's ability to integrate with others and therefore enable CSC to render a decision on candidacy for relocation to a medium. Inmates in these units share common program and occupational areas including gym and yard. The units have armed control posts, containment at the cell and range level but the ranges are more open.

S-7: Housing units at this level vary. All units are designed to have the highest degree of security including armed control posts and containment at the cell and range level. While most units are connected to an interior corridor, the most recently built units are stand alone but attached to the main institution by a fenced corridor. These latter units are provided with more programming capability to make them more autonomous thus reducing movement out of the units. S-6 max units have attached yards to limit

movement and group size. Galleries with intervention capability to most activity areas supplement the control post.

7.4 Special Handling Unit (SHU)

Special Handling Unit is essentially a maximum except that movement is even more restricted, activities more limited, and all inmate areas located at ground level with armed intervention possible to all circulation and activity areas. There are approximately 130 beds at this classification and the single facility is an annex to a main institution. A separate similar unit is located in another Region but it has been used as a maximum unit allowing for repurposing if the need arises. The main distinguishing feature of the housing unit is that all cells are located at ground level.

7.5 Multi-level institutions

Multi-level institutions serve a special purpose at CSC. Some accommodate inmates who are new to CSC to be assessed and pen placed. These institutions are referred to as Reception units. There are also Regional Health and Psychiatric centers for temporary stay from main institutions. And finally, there are remote institutions where different security levels are co-located on one site. Though the security levels are separated by fencing, some functions are shared. While the types of facilities are distinct for the third example, the first two examples would be more like a medium having no firearms except at the perimeter. Movement and activities for maximum security inmates would be more restrictive.

Approximately 12% of CSC beds are multi-level.

8. MEASURING MAXIMUM REGIONAL CAPACITIES

The infrastructure of every institution (accommodation, program areas, water, sewage, light, etc.) are designed, or redesigned, to accommodate a certain number of inmates. Institutions shall be designed to be capable of accommodating an additional 25% of inmates without significant strain on the original infrastructure or, where it exists, the later infrastructure resulting from redesign.

G-2 GENERAL – FIRE AUTHORITIES AND CLASSIFICATION

1. SCOPE

This section states the authorities associated with fire-related requirements for correctional institutions.

2. GENERAL

2.1 This section treats fire requirements in the broad sense; specific fire requirements are treated in greater detail in the appropriate sections of this document.

2.2 The term "HRDC - Fire Protection Services" [4] in this technical criteria section shall mean Human Resources Development Canada - Fire Protection Services (FPS) and shall include those officials representing HRDC - Fire Protection Services.

3. AUTHORITIES

3.1 HRDC - Fire Protection Services

3.1.1 HRDC - Fire Protection Services is the final authority in all fire related matters associated with correctional institutions.

3.1.2 The authority of HRDC - Fire Protection Services is derived from Order in Council and is not limited by the National Building Code (NBC). Final interpretation of the NBC therefore rests with HRDC - Fire Protection Services, who may overrule any portion of the Code and impose new requirements if necessary.

3.1.3 All Correctional Service Canada projects, including design and construction of new facilities as well as the renovation of existing facilities, must be approved by HRDC - Fire Protection Services. In each region, HRDC - Fire Protection Services is represented by a regional Fire Protection Engineer. The advice of Provincial Fire Commissioners, local Fire Marshals, and other safety inspectors will be respected, subject always to the prerogative of HRDC - Fire Protection Services to issue a final fire safety decision.

3.1.4 Plans and specifications of projects for the Correctional Service Canada shall be submitted to HRDC - Fire Protection Services at the 30% stage for input and for preliminary assessment, and at the 99% stage for final approval prior to tender call.

3.1.5 The Fire Protection Engineering Directorate, Office of HRDC - Fire Protection Services, in cooperation with the Technical Services Branch, CSC, has prepared a "Fire Protection Standard for Correctional Institutions" (Treasury Board Manual - Occupational Safety and Health, Chapter 3-6 - Fire Protection Standard for Correctional Institutions). This standard, available from the Technical Services and Facilities Branch, shall be followed in the development of all designs associated with CSC correctional institutions.

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[4] http://www.rhdcc-hrsdc.gc.ca/eng/labour/fire_protection/services/index.shtml

3.2 National Building Code

CSC projects shall be designed and constructed to meet the requirements of the National Building Code of Canada (NBC) except where overridden by the requirements of HRDC - Fire Protection Services. To that effect, Part 3 of NBC relates to most of CSC building and Part 9 of NBC relates to some housing and small buildings inside an institution.

3.3 Commissioner CSC

The Commissioner CSC has responsibility for the care and custody of inmates as such where design conflicts occur with HRDC – Fire Protection Services and which cannot be resolved during design development, the issues must be submitted jointly to both the Commissioner of CSC and HRDC - Fire Protection Services of Canada for resolution.

4. OCCUPANCY CLASSIFICATIONS

4.1 The fire classification of buildings is to be based upon the Treasury Board Manual - Occupational Safety and Health - Chapter 3-6 - Fire Protection Standard for Correctional Institutions and Section 3.1 of National Building Code[5] (NBC).

4.2 The NBC states that every building or part thereof shall be classified according to its major occupancy as belonging to one of the Groups or Divisions described in NBC Table 3.1.2.1.

The following are examples of occupancy classifications that would apply to buildings having free egress[6]:

Table G-1-1: Examples of Occupancy Classifications

Examples of Description of *Major Occupancies*	**Group**	**Division**
Recreation (Gymnasia and Fitness)	A	2
Kitchen and dining facilities	A	2
Socialization & Programs (Spiritual, Libraries, Meeting Rooms)	A	2
Medical services	B	2
Living units	C	
Administration	D	
Maintenance and works	F	2
Shops – Industrial & vocational	F	2
Stores, Garages & SIS	F	2

5 National Building Code of Canada 2005, National Research Council http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/05-national-building-code.html

6 Section 3.1 of the National Building Code of Canada 2005, National Research Council, especially subsection 3.1.2.1, Table 3.1.2.1 and Appendix *A-3.1.2.1.(1)* on page 359

4.3 Living units for minimum and medium security institutions which consist of single occupancy rooms or dormitories, and which allow "Free Egress" to exits for inmates from sleeping quarters shall be classified under the NBC as Group C Occupancies.

4.4 Any building in which any of the exits are locked is considered to be an impeded egress or contained use building and shall comply with the requirements of the NBC for Group B-1 Occupancies.

Any building with detention rooms is a contained use area. The most common examples are medium and maximum security living units. In order to qualify as having free egress, all required means of egress from a building or area must be without barriers. Otherwise, egress is considered to be impeded.

Impeded egress zones are buildings or portions thereof in which the occupants have some freedom of movement, but from which they cannot exit freely. Typical examples are operational buildings such as dining halls, recreation buildings, and training shops. Note that if any of the required means of egress are locked, egress is considered to be impeded.

Correctional Service Canada | Service correctionnel Canada

SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations

GO AND GI PROJECTS

SECTION SP - SITE

Canada

TABLE OF CONTENTS

SP-1 SITE PLANNING AND DEVELOPMENT

SP-2 FENCE

SP-3 GATES/SALLYPORT

SP-4 EXTERIOR LIGHTING

SP-5 TRAFFIC CIRCULATION AND PARKING

SP-6 TEMPORARY CONSTRUCTION & TEMPORARY SECURED CONSTRUCTION FENCES

SP-1 SITE – SITE PLANNING AND DEVELOPMENT

1. SCOPE

This section outlines planning and development principles and specific definitions of terms related to detention institutions.

2. RELATED SECTIONS

SP–2 – Fences
SP–3 – Institutional Access Controls
SP–4 – Lighting
SP–5 – Traffic Circulation and Parking

3. INSTITUTIONAL PROPERTY

There is no specific requirement regarding a demarcation or fencing at the CSC owned property line. Signage at the property limit is recommended. Where signage is used, it shall follow the Federal Identity Program[1].

Property features such as topographical conditions and existing trees and bushes shall be used to screen CSC institutions from adjoining properties. Landscaping and site development along the main entry road shall be visually appealing.

Where more than one institution is located on a CSC property, sufficient space shall be allowed between institutions. Minimum security institutions shall be located furthest from that part of a medium or maximum institution where inmate circulation and activities take place.

4. RESERVE OF OPEN LAND

4.1 Where possible and with minimal alterations to natural land and its ecology, a reserve of open land shall be provided for a distance of 100 m from the exterior of the outer perimeter fence to facilitate views of an intruder or escapee. Where natural grade changes exist, these shall be retained. Where open land reserves are smaller than the 100 m due to prohibitive site conditions or limiting extent of crown land, additional security measures may be required, as determined on a project specific basis

4.2 Landscaping for the first 100 m within the open land reserve shall consist of grasses, trees and shrubs which minimize the potential for screening an intruder or an escapee.

4.3 Due to specific operational requirements, the reserve of open land can extend over structures such as CSC service buildings, parking lots, flag posts and light standards, and site enhancements. These elements should be located close to the main entrance to the institution and away from inmate exterior circulation and activity areas in order to limit the potential for contraband transfer over the institutional perimeter.

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1 4.3 – Common-use and operational signs, Federal Identity Program Manual, March 1990 http://www.tbs-sct.gc.ca/fip-pcim/man_4_3-eng.asp

5. NO MAN ZONE

5.1 This zone is the ground area between the outer perimeter fence and the inner perimeter fence. The distance between the perimeter fences is 7.5 m.

5.2 The no man zone ground surface shall have the top soil removed and covered with filter fabric and crushed stone for a depth of at least 200 mm to minimize plant growth.

5.3 This zone is equipped with an in-ground sensor to detect motion. It is a component of the Perimeter Intrusion Detection System (PIDS), referred to as the Motion Detection System (MDS). To minimize false alarms activated by the MDS, the ground surface between the fences shall be graded to prevent pooling of water and run-off shall be collected as described in section SU-1, Storm and Sanitary Sewers.

5.4 This zone is covered by camera surveillance. The cameras will focus on the section of the fence line which has been disturbed. Cameras are an integrated part of the PIDS.

6. BUFFER ZONE

6.1 A 4-meter buffer zone parallel to the interior side of the inner perimeter fence shall be free of all structures, trees, shrubs and roads, except for road access through the perimeter and connecting interior fences where required.

6.2 Where adjacent to playfields, ceremonial grounds, and gardens, this zone shall be marked by signage informing inmates not to trespass. Fencing shall not be used to demarcate this zone as it only serves to obstruct views from the mobile patrols on the outside of the perimeter. As well, the fence may captures balls which may only encourage retrieval.

6.3 The buffer zone is covered by a separate line of cameras from those used to cover the no man zone. Similar to the no man zone, the cameras will focus on the section of the buffer zone in which the fence has been disturbed.

7. NO BUILDING ZONE

7.1 With the exception of the Gatehouse, no building shall be closer than 12 m to the inner perimeter fence.

8. NO INMATE ZONE

8.1 This is the area close to the Gatehouse and other functions which has restricted or limited access to inmates. There is no specific distance to delimit this zone as it varies depending on the plan configuration.

8.2 Functions accessible to inmates within this zone include Visits and Private family visits which are shared with outside visitors.

9. SITE PLANNING AND DEVELOPMENT OF AN INSTITUTION

9.1 Institutional buildings closest to the gatehouse shall accommodate functions which are inaccessible to inmates or where access is supervised. Those functions requiring vehicle

access for servicing and supplies shall also be relatively close to the gatehouse while vehicle access routes shall be away from inmate circulation and activity areas. Housing areas, playfields, gardens, and ceremonial grounds shall be located furthest from the entrance.

9.2 Soft landscaping is encouraged but plant type should be selected based on not obstructing views. Gentle contouring is also acceptable as are berms and timber retaining walls provided they do not facilitate hiding.

9.3 Colour and visual relief can be achieved in this area by the use of flowers beds, which shall be planted and maintained by inmates.

9.4 At medium level and above, all site furniture shall be secured in place. All walking surfaces shall be of monolithic material; small and light paving materials (brick, concrete pavers, or gravel) shall not be used.

9.5 Positive drainage for the entire site shall be provided with the use of ditches, swales and flumes. All drainage areas shall be designed to be as shallow as possible to allow for easier maintenance and for unobstructed visibility.

9.6 The minimum grade slope shall be 3% or gradual slope where natural grade changes exist for grass and landscaped areas.

10. SIGNAGE

10.1 All exterior and interior building signage shall conform to the Federal Identity Program (FIP). The FIP Manual is fully available at:

http://www.tbs-sct.gc.ca/fip-pcim/

10.2 The CSC "Search Sign" shall be located at each public entry leading to an institution. The "Search Sign" is a warning sign as prescribed in the Federal Identity Program Manual[2] (Caution!, Attention! under Type 3). The standard is yellow background with black letters. For the purpose of a reading distance of 30 m and a vehicular speed of 30 km/h, "x" is defined as 50 mm. Therefore, the text letters size is 50 mm (x) and the header letters size is 150 mm (3x). The layout is provided in Table 5 – Standard spaces, 50 mm to 200 mm x-height of section 4.3 of the FIP Manual (see footnote 8). The bilingual text is side by side, the official language on the left side being according to the regional practice. As the font and design follows the Federal Government standards the use of the Department signature or CSC crest is optional.

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[2] Federal Identity Program Manual – 4.3 Common-use and operational signs, Treasury Board of Canada, Secretariat, March 1990; http://www.tbs-sct.gc.ca/fip-pcim/documents/man_4_3__p1.pdf and http://www.tbs-sct.gc.ca/fip-pcim/documents/man_4_3__p2.pdf
Federal Identity Program Manual – 4.5 Signage typeface, Treasury Board of Canada, January 1988; http://www.tbs-sct.gc.ca/fip-pcim/documents/man_4_5.pdf

Attention! You are now entering a Correctional Service Canada reserve and all vehicles and persons on this reserve are subject to search.	**Attention!** Vous pénétrez présentement sur une réserve du Service Correctionnel Canada et tout véhicule et personne sur cette réserve sont sujets à être fouillés.

OR

Attention! Vous pénétrez présentement sur une réserve du Service Correctionnel Canada et tout véhicule et personne sur cette réserve sont sujets à être fouillés.	**Attention!** You are now entering a Correctional Service Canada reserve and all vehicles and persons on this reserve are subject to search.

Refer to *CAN/CGSB-109.1M-1989*[3] for the sign structure and characteristics.

10.3 All areas restricted only to authorized personnel shall be clearly and boldly identified according to the common-use and operational signs as described in the Federal Identity Program Manual[4]. Refer to section A-9 Interior Signage for interior signage requirements.

11. ENVIRONMENTAL

11.1 Only indigenous plants and locally available materials shall be used.

11.2 All layouts and landscape material shall take into account snow removal, grass cutting, watering and tree and shrub trimming to ensure minimum watering.

11.3 Snow storage areas shall be located in a manner that does not restrict drainage and visibility. A space wide enough to accommodate tractor power mowers shall be provided between trees and planting beds. Hose bibs shall be provided throughout the site as required on a project specific basis. Underground sprinkler are not acceptable.

12. PLAYFIELD

This is a designated area for athletic activities which is often, due to the area occupied, adjacent to the perimeter fences. The playfield shall be located far enough from a parking, the principal entrance or a gate, so that objects cannot be thrown within proximity of the playfield.

13. FLAG AND FLAGPOST

Rule and etiquette for "flying the flag" are fully available at:

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3 CAN/CGSB-109.1M-1989 – Signage System, Extruded Aluminum, Federal Identity Program

4 Page 11 – Federal Identity Program Manual – 4.3 Common-use and operational signs, Treasury Board of Canada, Secretariat, March 1990; http://www.tbs-sct.gc.ca/fip-pcim/documents/man_4_3__p1.pdf

http://www.pch.gc.ca/pgm/ceem-cced/etiqtt/101-eng.cfm

Refer to *CAN/CGSB-98.1-2003*[5] for the outdoor use of the National Flag of Canada.

[5] CAN/CGSB-98.1-20011 – National Flag of Canada (Outdoor Use) ICS 99.020.10

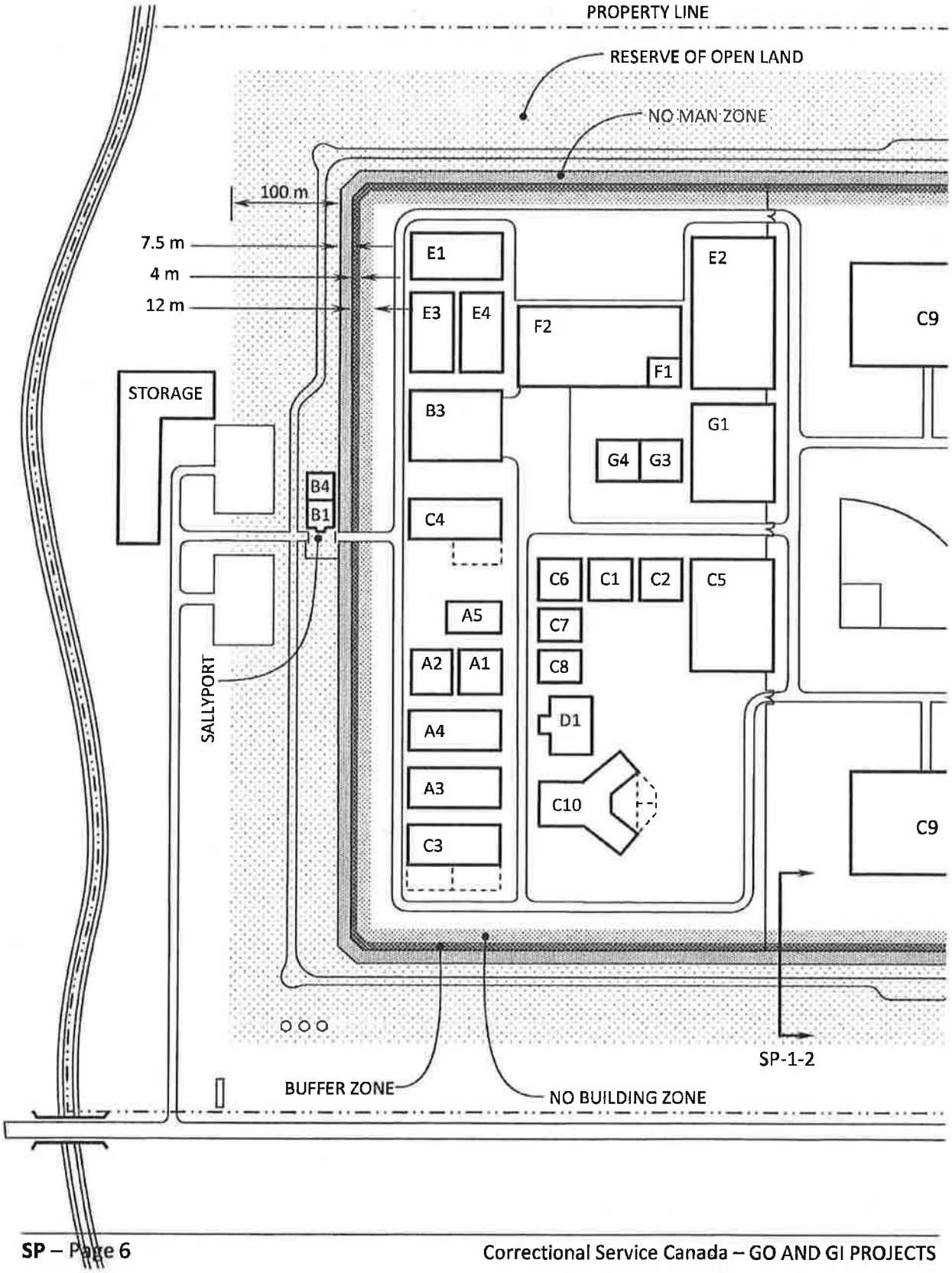
PROPERTY LINE
RESERVE OF OPEN LAND
NO MAN ZONE
100 m
7.5 m
4 m
12 m
E1
E2
E3
E4
F2
F1
C9
STORAGE
B3
G1
G4
G3
B4
B1
C4
C6
C1
C2
C5
A5
C7
A2
A1
C8
D1
A4
A3
C10
C3
C9
SALLYPORT
SP-1-2
BUFFER ZONE
NO BUILDING ZONE

PLATE SP-1-1

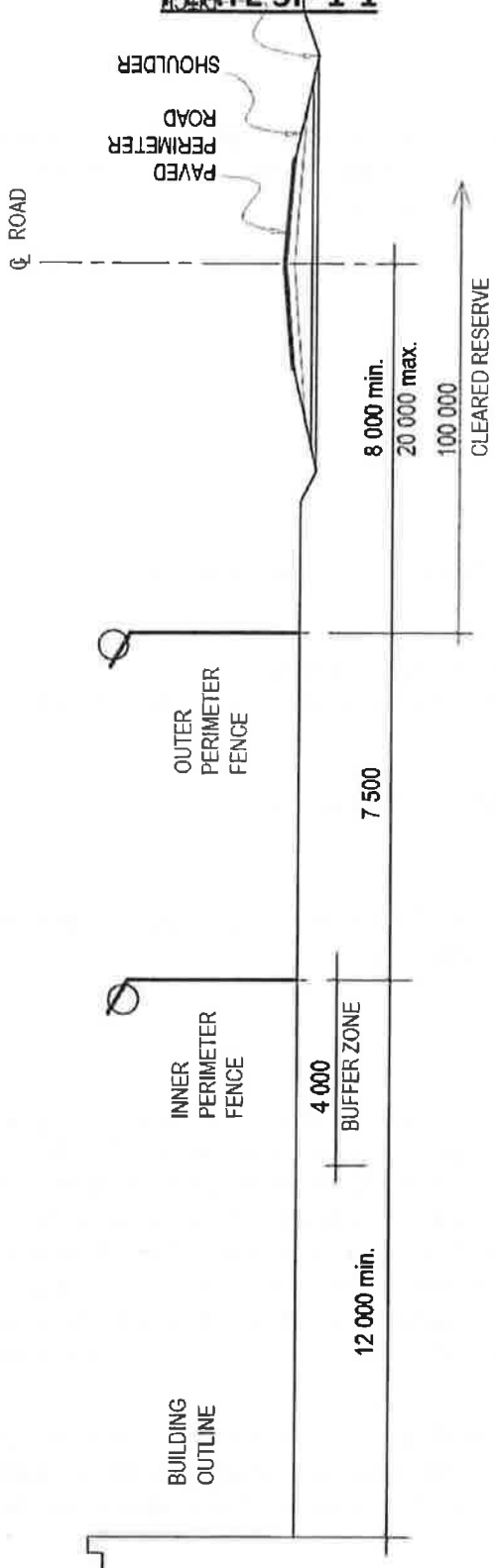

PLATE SP–1–2 – SECTION THROUGH FENCE AND ROAD

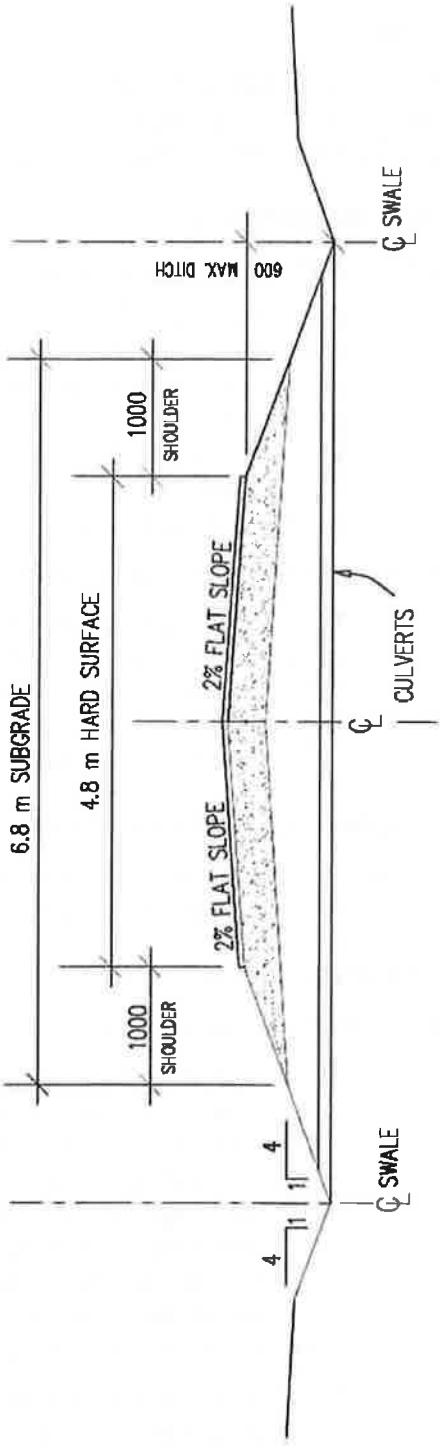

PLATE SP–1–3 – ROAD SECTION DETAIL

SP-2 SITE - FENCE

1. SCOPE

This section provides performance criteria and conforming specifications for all fences associated with institutions of security levels medium, maximum and multi-level inclusive. There are no special requirements for fences at minimum institutions.

2. RELATED SECTIONS

2.1 Technical Criteria Document sections:

SP–1 – Site Development
SP–3 – Gates/Sallyports
SP–5 – Traffic Circulation and Parking
SP–6 – Site Lighting
SP–7 – Double Fence Lighting
ST–1 – Guard Towers
& any sub-section referring to the Perimeter Intrusion Detection System (P.I.D.S.)

2.2 National Master Specification Section

01 35 13.16 – Special Project Procedures for Detention Facilities
28 01 10 – Operation & Maintenance of Electronic Access Control & Intrusion Detection
28 16 00 (13705) – Intrusion Detection
32 31 13 – Chain Link Fences and Gates
32 31 13.53 – High-Security Chain Link Fences and Gates

3. EXTERNAL BOUNDARY FENCES

External boundary (property) lines shall normally not be fenced unless specific site conditions warrant it. The type of fence in such locations will be project specific.

4. PERIMETER SECURITY FENCES

4.1 Performance Criteria

4.1.1 The institution will be enclosed by a double chain link fence perimeter supported by intrusion detection and camera system, and mobile patrol on the exterior of the perimeter. The perimeter fences form the last physical obstacle to escape from the institution. The design of the fence system shall be such that an escapee shall not be able to breach the perimeter in less than 45 seconds. This time duration is based on a maximum time for the perimeter security mobile patrol to respond after the first signal of an attempted escape is received at the Main communication control post (MCCP). The optimal reaction time for the mobile patrol is 30 seconds.

4.1.2 Fences shall be erected in straight lines from corner to corner for direct viewing by camera. The corners of the perimeter shall be truncated at 45° to allow suitable placement of camera poles and cameras to afford optimal viewing

between the fences and on the interior of the Inner Perimeter Fence. In addition, the truncated corners allow for a gentler curve of the patrol road.

4.1.3 To render climbing more difficult, the fence fabric shall be installed on the institution side of the fence posts. Sharp corners of less than 120°, shall be avoided except where fences intersect.

4.1.4 For fences equipped with a Fence Detection System (FDS), the fence shall balance fabric tension to ensure fabric vibration travel across posts while not causing excessive false alarms. Fabric vibration terminates at strain post locations where the fence fabric ends thus allowing zone separations for the PIDS.

4.1.5 Special attention shall be paid to sloped sites to ensure that gaps do not develop between the ground surface and the lower fence rail. Where necessary, due to severe ground slope longitudinally, fencing may be stepped, but the minimum height of the fence shall be maintained at all times. Ground slope across the fence line shall be minimized to prevent erosion under the perimeter fences

4.1.6 Water shall be prevented from pooling between the perimeter fences, as this could affect the operation of the Motion Detection System (MDS). For special underground drainage requirements relating to perimeter fences, see sections SU-1 Storm and Sanitary Sewers.

4.1.7 Barbed tape concertina (BTC) wire shall be installed in such a manner that it prevents the passage of a person across the barbed coils. (See plates SP-2-2 and SP-2-3).

4.1.8 For interior fences intersecting the Inner Perimeter Fence, the interior fence shall be designed to prevent it from being used to aid in crossing the Inner Perimeter Fence. To achieve this, the interior fence shall be equipped with:

- a Fence detection system (FDS) for a length of 2.5 meters. The fence fabric shall extend for that length and be connected to a strain post so that the vibration does not travel beyond.
- and BTC on both sides on the fence No gap between posts or fabric shall exceed 125 mm.

4.1.9 To inhibit tunnelling under the Inner Perimeter Fence, a ground barrier shall be provided by installing either a continuous concrete footing or a concrete sidewalk on the institution side. (See Plate SP-2-1). Roadways crossing perimeter fence lines shall be topped with asphalt which also serves as a ground barrier.

4.1.10 The system of line, strain, corner and gate posts shall be installed to meet local environmental conditions, particularly those of wind and wet snow storms. To respond to these conditions, foundation calculations demonstrating performance which will meet site wind and snow conditions must be carried out.

4.1.11 Where a building or other structure interrupts the perimeter fence run, the design to ensure perimeter integrity shall be approved by the issuing authority.

4.1.12 Where a perimeter comprises or integrates a wall, the design to ensure perimeter integrity shall be approved by the issuing authority.

4.2 Conforming Specifications

4.2.1 Perimeter fences shall consist of two (2) parallel fences, erected in straight lines, with a 7.5-m gravel strip between the fence lines. For retrofit installations, where it has been proven that a lesser separation has been effective, the existing spacing shall be maintained. Height of both fences, excluding overhang arms, shall be 3.6 m. Corners shall be truncated and the maximum length of the interior fence on the truncated line shall be 25 m.

4.2.2 No structure, with the exception of the Gatehouse and guard towers, shall be closer than 12 m to the Inner Perimeter Fence.

4.2.3 The area between the perimeter security fences shall be free of topsoil and be graded to a slope of 2% from the interior to the Outer Perimeter Fence. The surface will then be covered with a filter fabric and topped with a mix of 0 mm to 20 mm crushed stone to a depth of 200 mm. For the Outer Perimeter Fence an area of 500 mm on each side of the fence shall be stabilized to a depth of 300 mm with a compaction of 95% corrected maximum dry density to hinder run off erosion and tunnelling by inmates.

4.2.4 All chain link fencing shall be installed in accordance with the *National Master Specification (NMS) 32 31 13*[1] and *CAN/CGSB-138.3-96* standard[2]. Where there is a conflict between the NMS and this criterion, the TCD shall prevail.

4.2.5 Chain link fence fabric shall conform to the following specifications[3]:

4.2.5.1 Wire Size: 4.8 mm (min) (6 Gauge)

4.2.5.2 Size of mesh: 50.8 mm

4.2.5.3 Height of fence fabric: 3600 mm

4.2.5.4 Barbed edges top and bottom

4.2.5.5 Average mass of zinc coating to be not less than 610 g/m^2 of uncoated wire

4.2.5.6 Breaking tensile strength to be 10,000 N·min.

4.2.6 Wire mesh shall be continuous from top to bottom and shall be applied on the institutional compound side of the posts.

4.2.7 Fence fabric shall be pulled taut before fixing in place. Tautness, when fixed in place, is to be established by pull tests. The application of a 12 kg perpendicular pull at the midpoint of the mesh panel (midpoint of posts/rails) shall show a displacement of no more than 30 mm from the fence at rest plane.

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1 National Master Specification 32 31 13 – Chain Link Fences and Gates (2004/12/31), there is also specifically Masterformat reference number 32 31 13.53 for High-Security Chain Link Fences And Gates

2 CAN/CGSB-138.3-96 – Installation of Chain Link Fence

3 Refer also to: CAN/CGSB-138.1-96 – Fabric for Chain Link Fence

4.2.8 Posts, (corner, gate, strain, line) shall conform to *CAN/CGSB-138.2-96* [4], galvanized steel pipe.

4.2.8.1 Posts shall be spaced a maximum of 2.5 m apart.

4.2.8.2 Line post minimal size shall be 73 mm O.D. 8.6 kg/m.

4.2.8.3 Strain post minimum size shall be 114.3 mm O.D. 15.92 kg/m. Strain posts shall be spaced not more than 60 m apart.

4.2.8.4 Corner and gate post minimum size shall be 150 mm O.D. 21.0 kg/m.

4.2.9 Galvanized steel arms shall be provided on all posts where barbed concertina is to be installed, as shown on Plate SP-2-2 and SP-2-3.

4.2.10 Bottom and top rails shall be 42.2 mm O.D. minimum, 3.4 kg/m.

4.2.11 Tie wires shall be 3.7 mm diameter (9 gauge) galvanized steel wire to secure chain link fabric to bottom rail, top rail and line posts at 300 mm spacing.

4.2.12 An intermediate galvanized anchor shall be used to secure the bottom rail to the ground barrier, where such a barrier is installed. This anchor shall limit vertical movement of the bottom rail to a maximum of 125 mm.

4.2.13 Intermediate rails shall not be used.

4.2.14 Tension bars shall be 5 mm x 20 mm minimum x 3600 mm galvanized steel.

4.2.15 Tension bar bands shall be 3 mm x 20 mm minimum galvanized steel.

4.2.16 Where nuts and bolts are required for fastening, nuts shall face compound exterior and be torqued tight.

4.2.17 Where tension cables are used at corner, end, gate, strain posts, and fittings shall be of galvanized steel.

4.2.18 Barbed tape concertina (B.T.C.) shall be galvanized tape 20 x 0.5 mm clenched around a 2.5 mm diameter spring steel galvanized core wire to form a concertina coil with a nominal exterior coil diameter of 710 mm. The coil, when installed, shall have a minimum diameter of 635 mm. The barbed concertina shall have 20 mm long blade type barbs measured from tip to tip of the blade, and barb clusters shall be spaced approximately 45 mm on centre (see Plate SP-2-3). The concertina shall be formed by clipping adjacent loops of single helical coils together at a minimum of three (3) points on the circumference. Clips shall be galvanized. The resulting coil, when stretched, shall form a cylindrical pattern. The loop spacing shall not exceed 230 mm.

4.2.19 For concertina coil support at fence top, two barbed wires stretched and fixed to post arms shall be provided. Barbed wire shall consist of two strands of 12 gauge wire with 4 point barbs at 130 mm spacing, all galvanized.

[4] CAN/CGSB-138.2-96 -- Steel Framework for Chain Link Fence

4.2.20 Concertina coils are to be turned onto a secondary internal fence for a distance of 2.5 m when such a fence meets the perimeter fence. (See plate SP-2-6).

4.2.21 Installation of barbed tape coils shall be as follows:

4.2.21.1 The barbed tape concertina is to be supported and tied at 230 mm spacing onto each of the barbed wire. Additional coils that are required on fences are to be tied as shown on Plate SP-2-3.

4.2.21.2 A second row of BTC may be installed on fence tops at existing sites due to local conditions with the approval of the issuing authority (see plate SP-2-3)

5. INTERIOR FENCES

5.1 Area and Yard Fences

5.1.1 Performance Criteria

5.1.1.1 Interior fences shall be a maximum of 3.6 m in height and shall be topped with barbed wire and BTC only at Maximum security institutions and around segregation yards. Other locations may be considered with approval of the issuing authority.

5.1.1.2 Posts shall be provided with Post caps where posts arms are not provided.

5.1.1.3 Where interior fences intersect the Inner Perimeter Fence, refer to item 4.1.8 above and plate SP-2-6

5.1.1.4 Tunnelling barriers are not required on interior fences except where they are topped with BTC. Barrier shall be compacted gravel to 500 mm on either side except where the yard is asphalted.

5.1.1.5 Fenced shall not be used to demarcate the buffer zone.

5.1.2 Conforming Specifications

5.1.2.1 Materials shall be similar to those specified for the perimeter fences (see item 4.2).

5.1.2.2 Two coils of BTC shall be installed on the top of the Segregation exercise yard fence as indicated on Plate SP-2-3. An unscalable solid wall shall be provided where visibility and contact is at issue with approval of the issuing authority.

6. DUAL COMPOUND FENCE

6.1 Performance Criteria

Where one institution is composed of two compounds which have two separate populations and shared services, the compounds shall be separated by dual 3.6-m high chain link fences. Fence construction shall be of the same quality as that required for the Inner Perimeter Fence system, including the barbed tape concertina top (item 4). A

concrete ground barrier is required on the higher security compound side of the fence. Both fences shall be equipped with an FDS and cameras and integrated with the PIDS.

6.2 **Conforming Specification**

Specifications are similar to those for the Inner Perimeter Fence (item 4), including the requirement for single concertina on top of both fences; fence tops, however, should be oriented toward the institution which the fence encloses.

7. EXTERIOR SERVICE COMPOUND FENCE

7.1 Performance Criteria

Where bulk fuel storage (propane and gasoline) is provided, the storage area shall be fenced (see section SP-5, Traffic Circulation and Parking).

7.2 Conforming Specifications

7.2.1 Materials will be similar to those specified for the perimeter fences (item 4).

7.2.2 Fence height shall be 2.5 m.

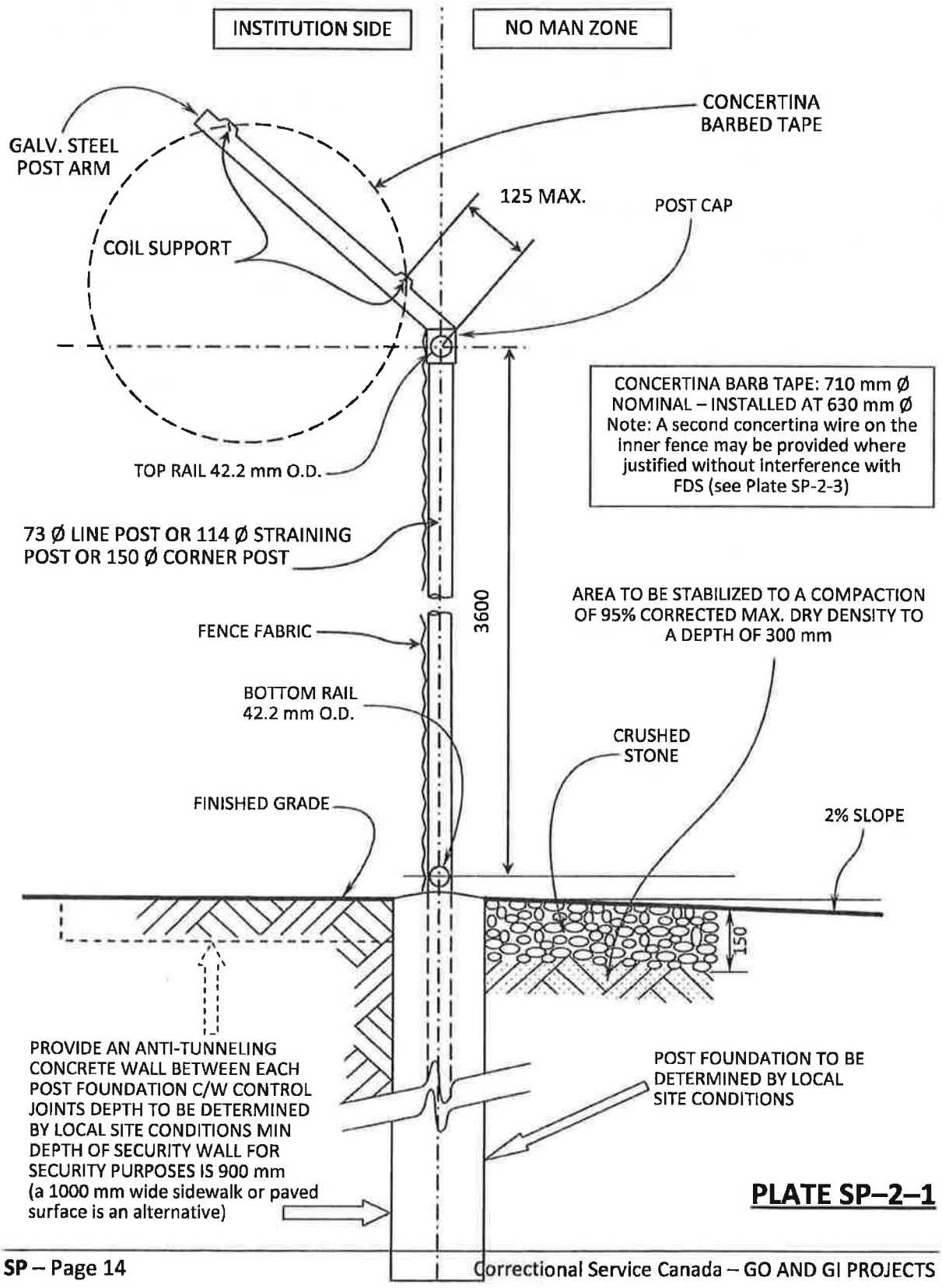
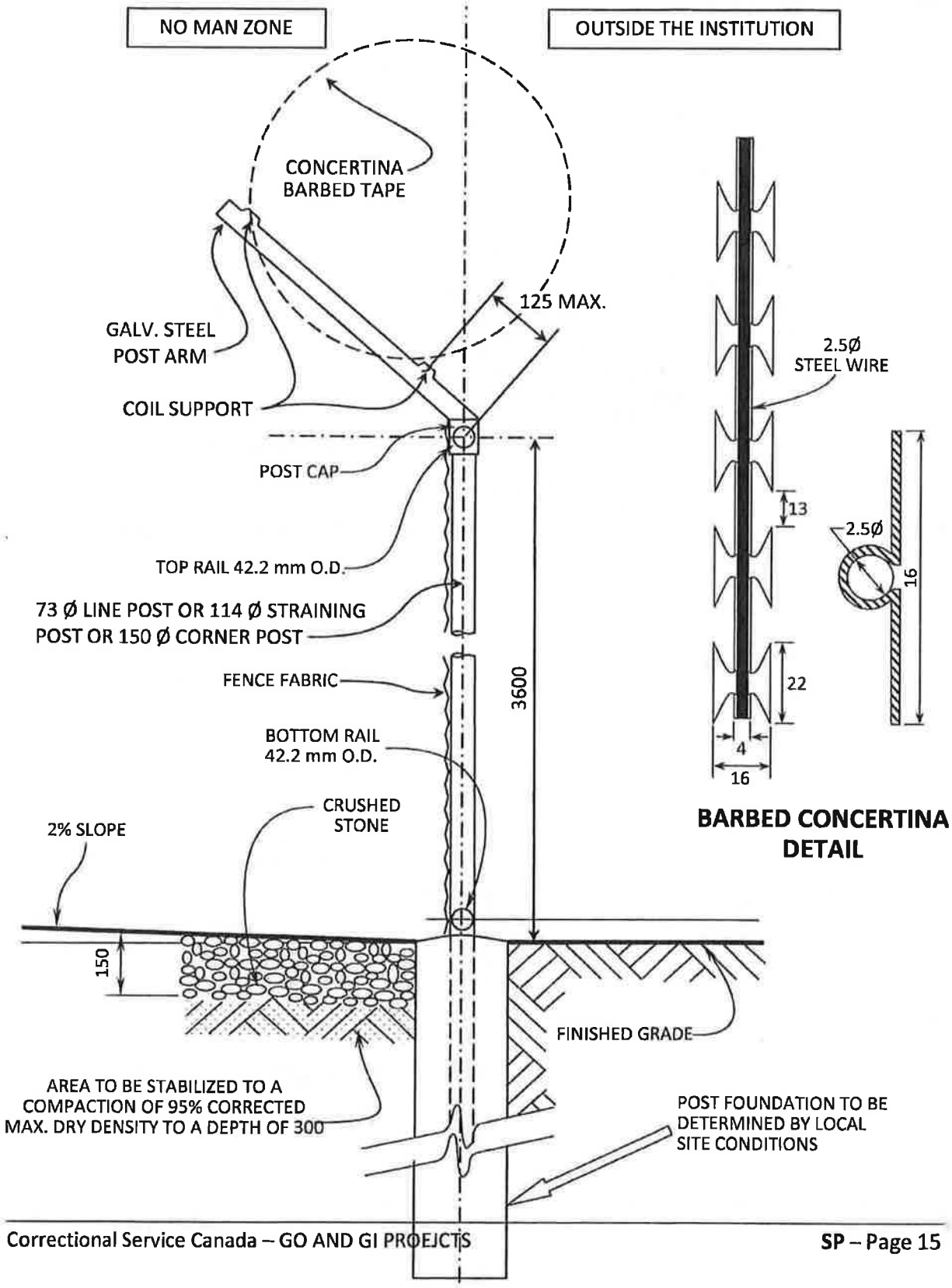

INSTITUTION SIDE
NO MAN ZONE
GALV. STEEL POST ARM
CONCERTINA BARBED TAPE
125 MAX.
POST CAP
COIL SUPPORT
TOP RAIL 42.2 mm O.D.
CONCERTINA BARB TAPE: 710 mm Ø NOMINAL – INSTALLED AT 630 mm Ø
Note: A second concertina wire on the inner fence may be provided where justified without interference with FDS (see Plate SP-2-3)
73 Ø LINE POST OR 114 Ø STRAINING POST OR 150 Ø CORNER POST
3600
AREA TO BE STABILIZED TO A COMPACTION OF 95% CORRECTED MAX. DRY DENSITY TO A DEPTH OF 300 mm
FENCE FABRIC
BOTTOM RAIL 42.2 mm O.D.
CRUSHED STONE
FINISHED GRADE
2% SLOPE
150
PROVIDE AN ANTI-TUNNELING CONCRETE WALL BETWEEN EACH POST FOUNDATION C/W CONTROL JOINTS DEPTH TO BE DETERMINED BY LOCAL SITE CONDITIONS MIN DEPTH OF SECURITY WALL FOR SECURITY PURPOSES IS 900 mm (a 1000 mm wide sidewalk or paved surface is an alternative)
POST FOUNDATION TO BE DETERMINED BY LOCAL SITE CONDITIONS

PLATE SP–2–1

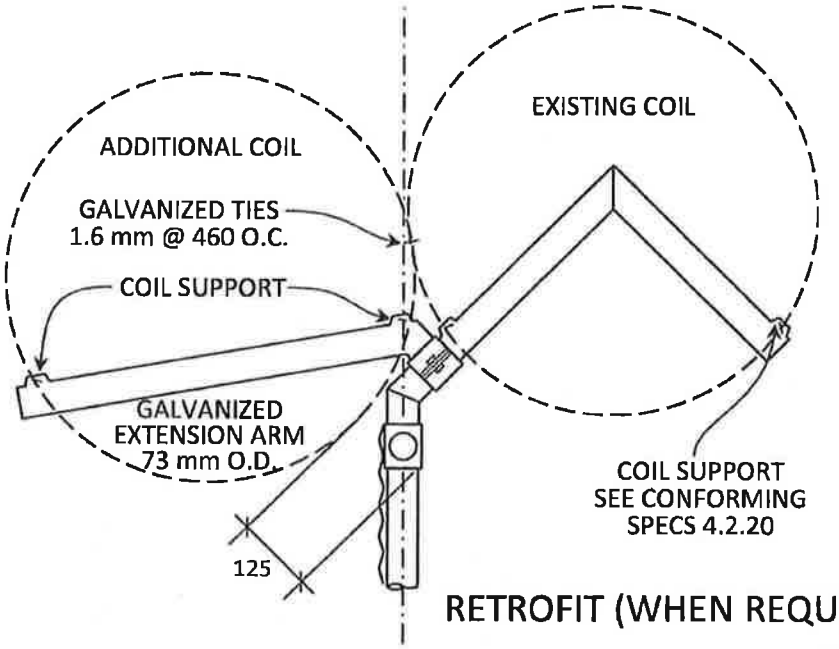
INNER PERIMETER FENCE



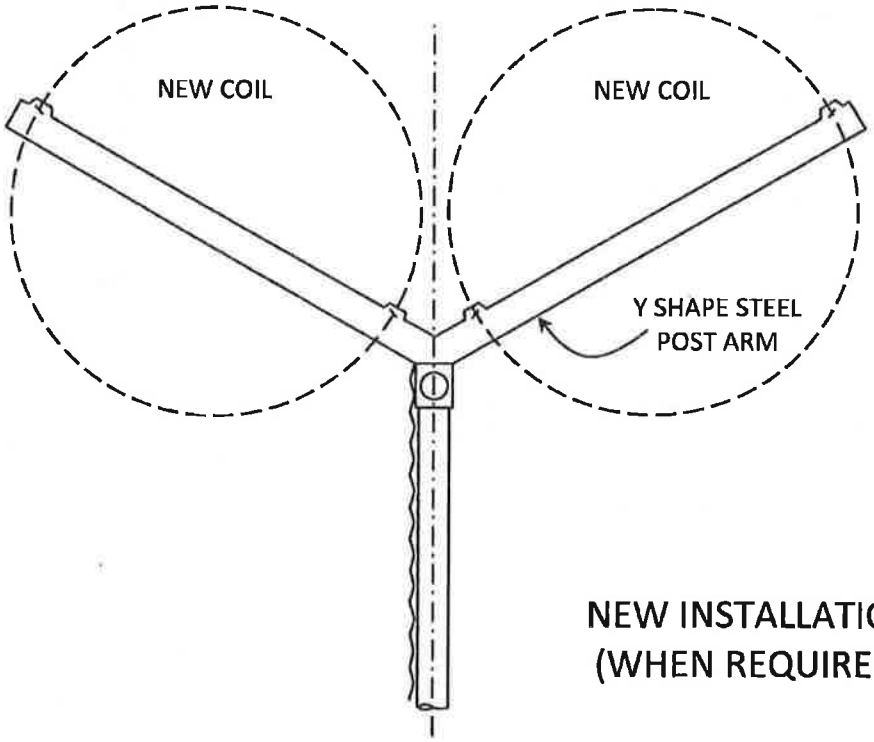
BARBED CONCERTINA DETAIL

PLATE SP–2–2
OUTER PERIMETER FENCE

CONCERTINA BARB TAPE:
710 mm Ø NOMINAL – INSTALLED
AT 630 mm Ø



RETROFIT (WHEN REQUIRED)



NEW INSTALLATION
(WHEN REQUIRED)

PLATE SP–2–3 – INNER FENCE WITH A SECOND CONCERTINA TAPE

CONCERTINA BARB TAPE: 710 mm Ø NOMINAL – INSTALLED AT 630 mm Ø

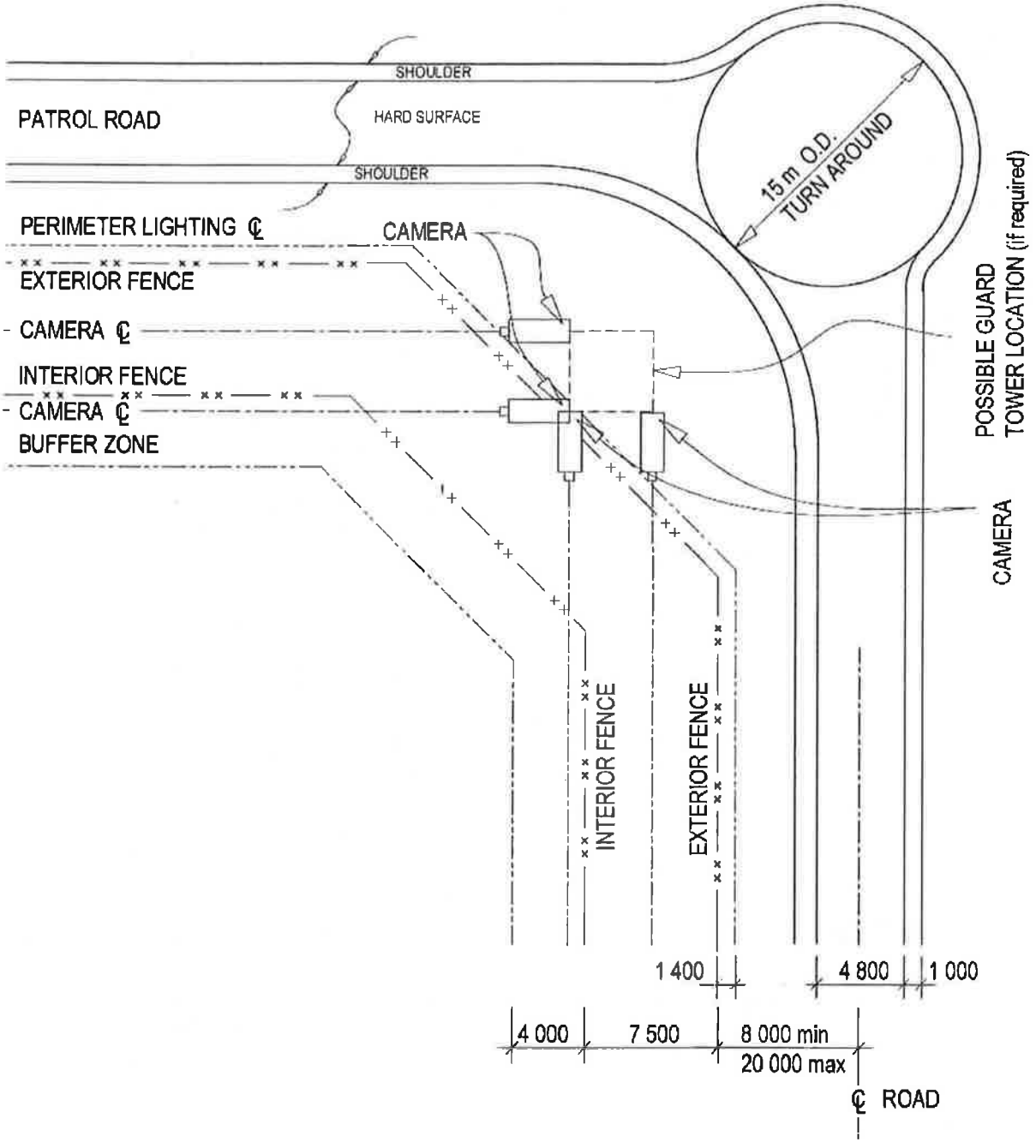


PLATE SP–2–4 – TYPICAL PERIMETER FENCE CORNER WITH TOWER

Note: Camera lines are for information purpose only

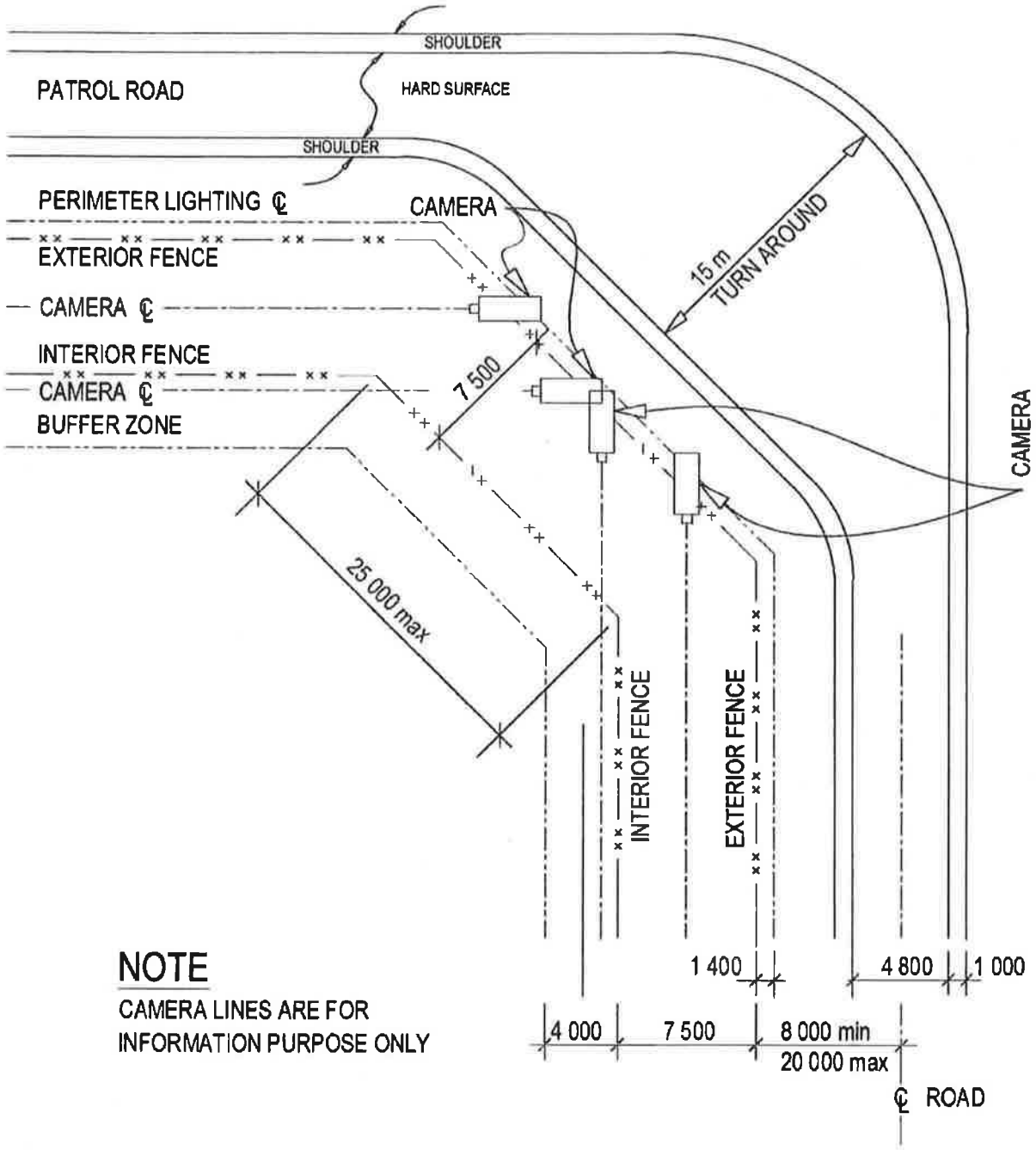


PLATE SP–2–5 – TYPICAL PERIMETER FENCE CORNER WITHOUT TOWER

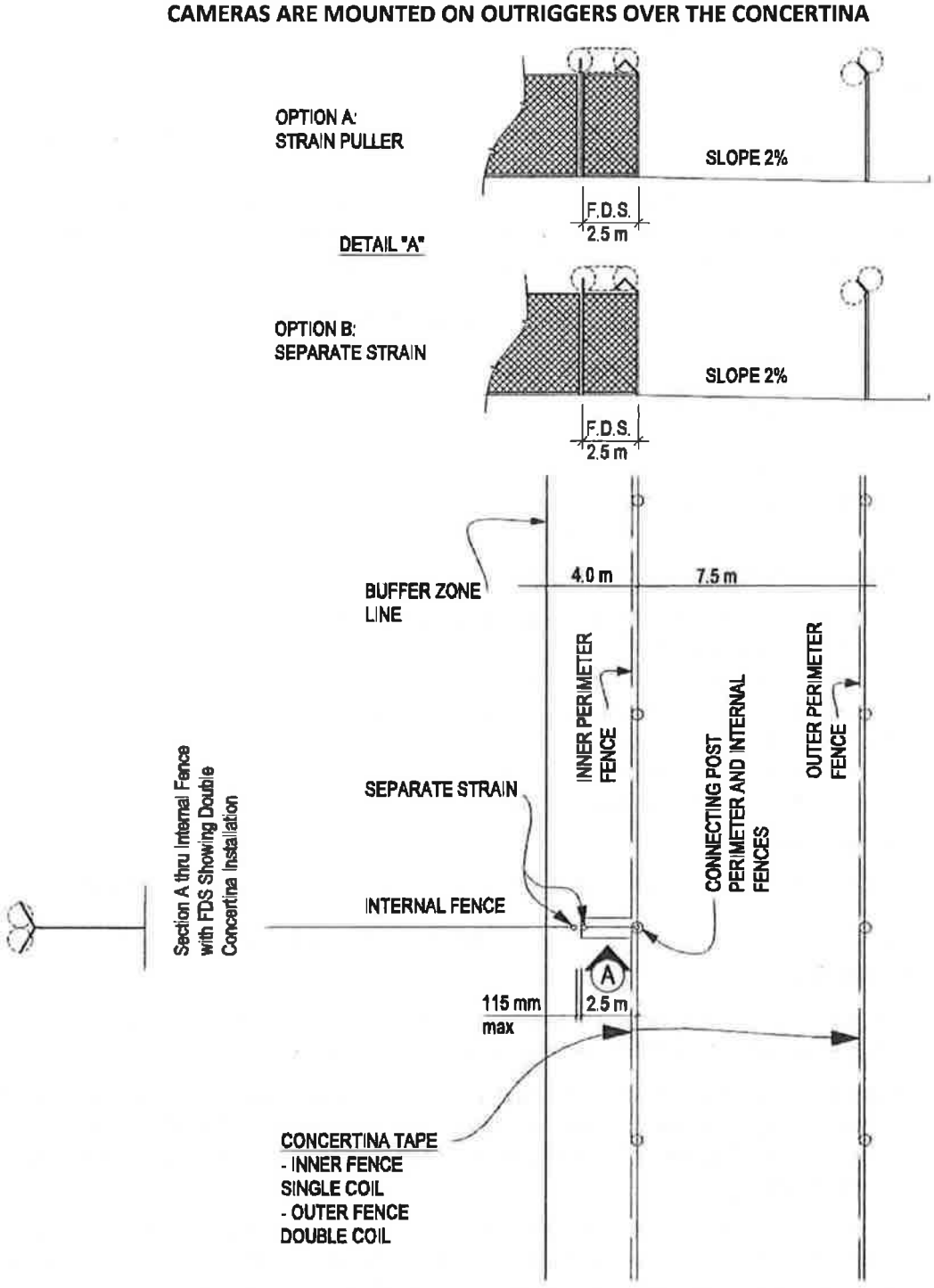


PLATE SP–2–6 – INTERNAL FENCES INTERSECTING WITH THE PERIFERAL FENCES – DETAILS

SP-3 SITE – GATES/SALLYPORT

1. SCOPE

This section outlines requirements for vehicle and pedestrian access and egress control for institutions which have a secure perimeter as at medium, maximum and multi-level institutions.

Access and egress control for open minimum institutions involves signage and reporting to a 24 hr Duty office but does not include fencing and gates. Refer to A-12 Control posts for functional requirements as well as the CSC Accommodation Guidelines.

2. RELATED SECTIONS

2.1 Technical Criteria Document sections:

SP–1 – Site Development
SP–2 – Fences
A–6 – Hardware
A–10 – Contraband Control Systems
A–12 – Control Posts and Dedicated Security Routes

2.2 National Master Specification Section

01 35 13.16 – Special Project Procedures for Detention Facilities
08 34 56 – Security Gates
32 31 13 – Chain Link Fences and Gates
  32 31 13.53 – High-Security Chain Link Fences and Gates
34 71 13 – Vehicle Barriers
  34 71 13.16 – Vehicle Crash Barriers
  34 75 13.13 – Active Vehicle Barriers

2.3 ASTM Standards

F2656–07 – Standard Test Method for Vehicle Crash Testing of Perimeter Barriers

3. ACCESS CONTROL SECURITY REQUIREMENTS

3.1 All new institutions equipped with a fenced perimeter shall have one entrance point for pedestrian and vehicle traffic, referred to as the Principal Entrance.

3.2 Because the Principal Entrance may at some time be inoperable, one Emergency Vehicle Entrance shall be provided, to be located at a point convenient for vehicle access. This Emergency Vehicle Entrance can be either a Sliding Gate (Section 5.1) or a Swing Gate (Section 5.2).

3.3 Vehicle access shall be provided into the area between the inner and Outer Perimeter Fences for snow clearing and maintenance of the Motion Detection System (MDS). Snow build up between the fences can adversely affect the operation of the MDS.

4. PRINCIPAL ENTRANCE

4.1 Definition

The Principal Entrance is formed by a Gatehouse for pedestrian traffic control and an open air chain-link fence compound with inter locking gates for vehicle traffic control (vehicle sallyport). The Gatehouse contains the Principal Entrance Control Post, in which staff shall supervise all traffic through the Principal Entrance and maintain remote operation of gates. For detailed requirements see A-12 Control Posts and Dedicated Security Routes.

4.1.1 All vehicle sallyports shall be equipped with sliding gates. The sliding gates shall be remote controlled from the Principal Entrance control post and interlocked to prevent simultaneous unlocking. The sliding gates control must provide for the opening of one of the gate only when the other gate is in its latched position. Both gates shall be also capable of manual unlocking and opening.

4.1.2 Vehicle sallyports shall be sized to include an inspection area, to facilitate a thorough inspection of vehicles, which can hold in width two van type trucks (8.5 m min.), and hold one semi trailer truck in length (23 m min.).

4.1.3 In order to prevent forced drive through of vehicles, the exterior gate of the vehicle sallyport shall be equipped with a crash barrier (see section 4.4 and Plates SP-3-6 to SP-3-8).

4.1.4 All Principal Entrance pedestrian traffic shall be physically separated from vehicular traffic.

4.1.5 Where vehicle access into the area between the perimeter fences is provided from the vehicle sallyport, the gates shall be swing type, manually operated and lockable.

4.1.6 All pedestrian traffic through the Principal Entrance, including traffic between the vehicle sallyport and the pedestrian sallyport, shall be through swing gates. Principal Entrance pedestrian gates shall be remote unlocking, self closing and locking, and capable of manual unlocking.

4.1.7 To allow continuous CCTV coverage of the area between the perimeter fences while maintaining a minimum number of cameras, the Gatehouse building shall be sited on the outside of the Outer Perimeter Fence with one face of the building flush with that Outer Perimeter Fence.

4.1.8 See Plate SP-3-1 for a typical Principal Entrance layout.

NOTE: At institutions where a secondary vehicle service entrance sallyport exists, those sallyport gates shall be controlled remotely from either the Principal Entrance Control Post or the Main Control Post. An officer shelter inside the sallyport is to be provided for the vehicle inspection officer. Principal Entrance or Main Control Posts with remote gate operation shall view the sallyport and officer shelter via CCTV set up.

4.2 Crash Barriers

4.2.1 Crash barriers for sallyport sliding gates shall be connected to the interior side of the exterior gate and shall be operated simultaneously with the remote operation of the gate.

4.2.2 In order to resist vehicle impact, crash barriers shall be made of an I-beam or rectangular tubing supported on anti friction rollers with a minimum of three (3) heavy uprights. In a test equivalent to the US Department of State K4 certification[1] (6 804 kg @ 48.3 km/hr or 15,000 lbs @ 30 mph) the vehicle must be inoperable after hitting the crash bar. The main purpose of the beam is to cause maximum damage to ramming vehicle.

4.2.3 The first heavy upright supports the crash barrier extension opposed to the opening, the second upright supports the crash barrier extension on the side of the opening and acts as a protection bollard for the inside post of the opening and for the gate operator when a rack and pinion system is in use. The third upright supports the crash barrier only in its closed position and acts as a protection bollard for the outside post of the opening. At any time the crash barrier is supported by the first and second uprights.

4.2.4 If crash barriers are used for emergency gates on the perimeter, they shall be made of a simple beam or rectangular tubing with a counter weight mechanically lifted and lockable in closed position with the use of a security padlock.

4.2.5 Gate having integrated crash bar or crash cables system are acceptable if they meet M30 designation of *ASTM F2656-07*[2], K4 certification of the US Department of State (see footnote 1) or the European equivalent[3].

4.2.6 See Plates SP-3-3 to SP-3-6 for typical sallyport crash barrier.

5. FENCE GATES

5.1 Vehicle Sliding Gates

5.1.1 The size of each gate shall provide for a 4 m wide x 4.5 m high clear opening.

5.1.2 Gate chain link fabric shall match perimeter fence. (See section SP-2, Fences).

5.1.3 Gate framing members shall be 73 mm O.D. pipe weighing 8.6 kg/m welded and drained.

5.1.4 Motorized gates shall be capable of moving at a speed of 150 mm/s.

5.1.5 Gate shall have three point locking (top, bottom and middle).

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1 US Department of State SD–STD–02.01, Revision A , March 2003, Test Method for Vehicle Crash Gate Testing of Perimeter Barriers and Gates

2 ASTM F2656–07, Standard Test Method for Vehicle Crash Testing of Perimeter Barriers, M30 Designation: Medium-duty truck (M) 6800 kg @ 50 km/h

3 BSI – PAS68:2010 – Impact test specifications for vehicle security barriers, January 2010. Most of the British manufacturers refers primarily to this standard, but in general also mention the USDS equivalent

5.1.6 Locking column shall be equipped with an Emergency manual control mechanism located for easy access.

5.1.7 Operator and track shall be protected and electrically heated to ensure all weather operation. In rack and pinion system (or "drive rail" operator) the teeth of the rack can be unprotected provided that they are on the lower side of the rack and visible to the operator. Where crash beams are installed on a sliding gate, the additional weight shall be taken into account.

5.1.8 For overhead rack system, a guide shall be provided at the bottom of the gate.

5.1.9 All gate components shall be galvanized.

5.1.10 All security hardware shall be in accordance with chapter A-6, Hardware of the present document. All other components shall be in accordance with the Fences section of this criterion.

5.1.11 See Plates SP-3-2 and SP-3-3 for a typical gate installation.

5.2 Vehicle Swing Gates (Perimeter and Internal Fences)

5.2.1 Gates shall consist of a pair of 2 m wide by 4.5 m high sections, for an opening of 4 m wide X 4.5 m high, except where municipal by law or sufficient height and width for local emergency vehicles (fire trucks) dictate otherwise[4].

5.2.2 The swing direction of gates shall be determined after consideration of operational and snow conditions.

5.2.3 Any gap between the bottom rail of a gate and the ground shall not exceed 125 mm. Where gates are located on a fence equipped with a ground barrier, this barrier shall be continuous.

5.2.4 The chain link fabric for gates shall match the fence on which it is mounted (see section SP-2, Fences).

5.2.5 Gate framing shall be as per item 5.1.3 above.

5.2.6 There shall be three gate hinges and they shall be of standard quality. Foot and mid height locking shall be accomplished with Folger Adam detention grade locks or equivalent.

5.2.7 Plate SP-3-7 illustrates a typical design for vehicle swing gate.

5.3 Pedestrian Gates (Perimeter and Internal Fences)

5.3.1 The size of each swing gate shall provide for a 1.2 m wide x 2.1 m high clear opening.

5.3.2 Items 5.2.2, 5.2.3 and 5.2.4 noted above for vehicle swing gates shall apply.

5.3.3 Swing gate framing members shall be 43 mm O.D. pipe weighing 3.4 kg/m.

5.3.4 Swing gates shall be manually operated with security key locks when gates are used daily. Principal Entrance gates shall be remote unlocked and equipped with closers. Infrequently used gates shall be security padlocked.

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[4] For example, in Ontario the *Highway Traffic Act* Section 109 stipulate a maximum height of 4.15 m by a width of 2.6 m, which is similar to the 13'-6" (4.12 m) by 8 (2.43 m) in USA.

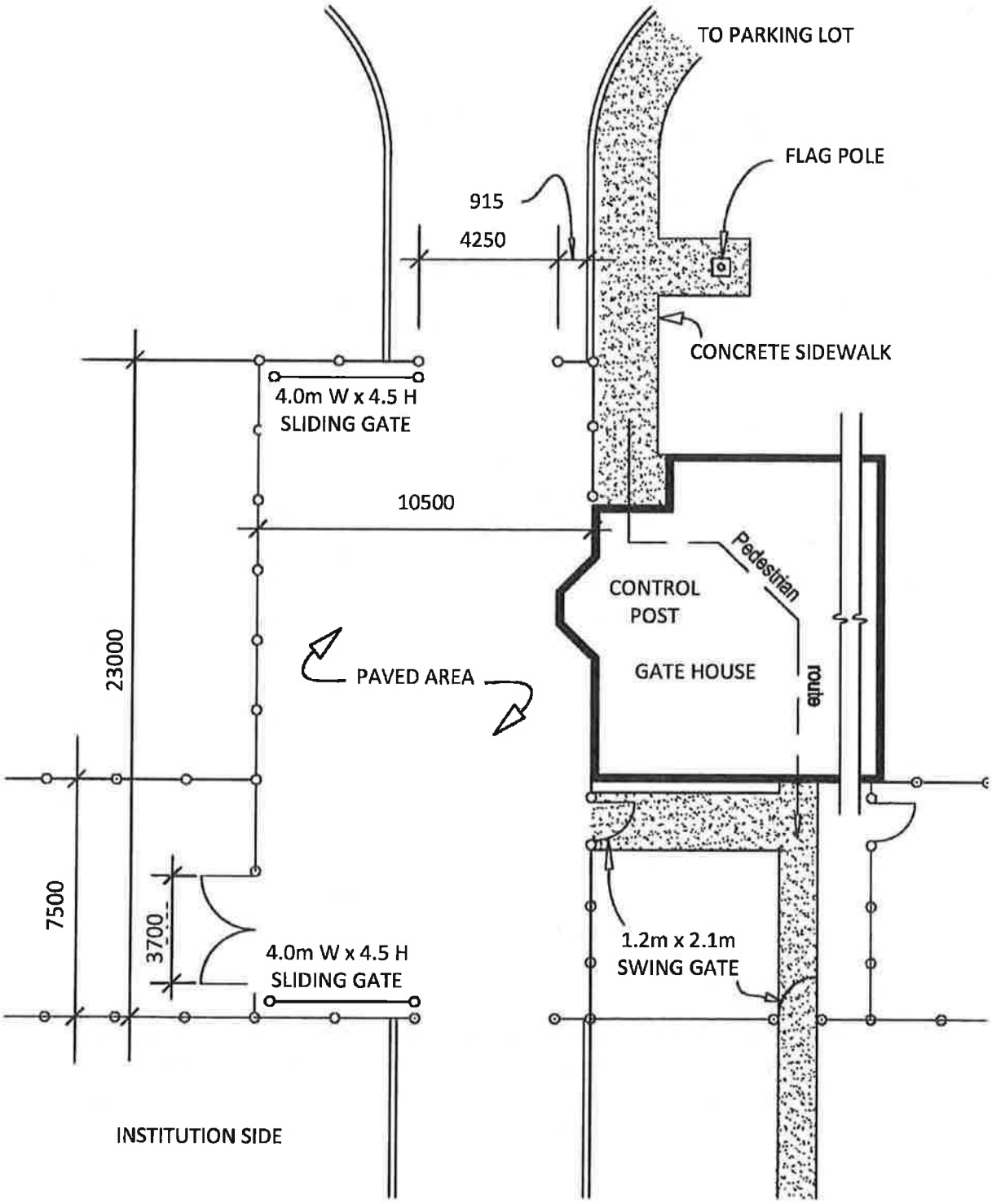
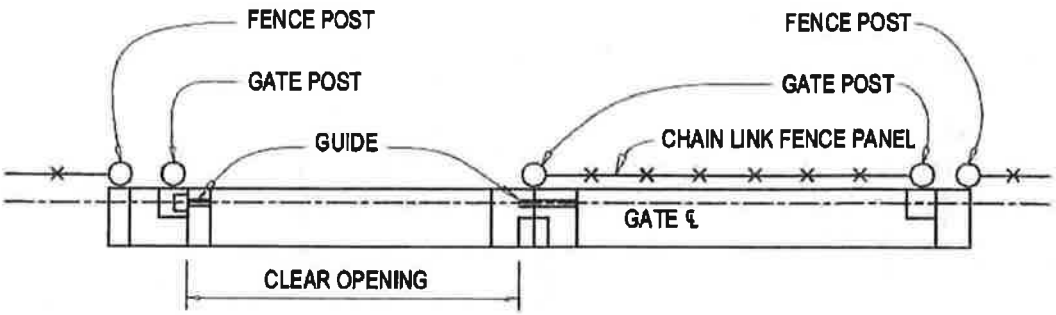
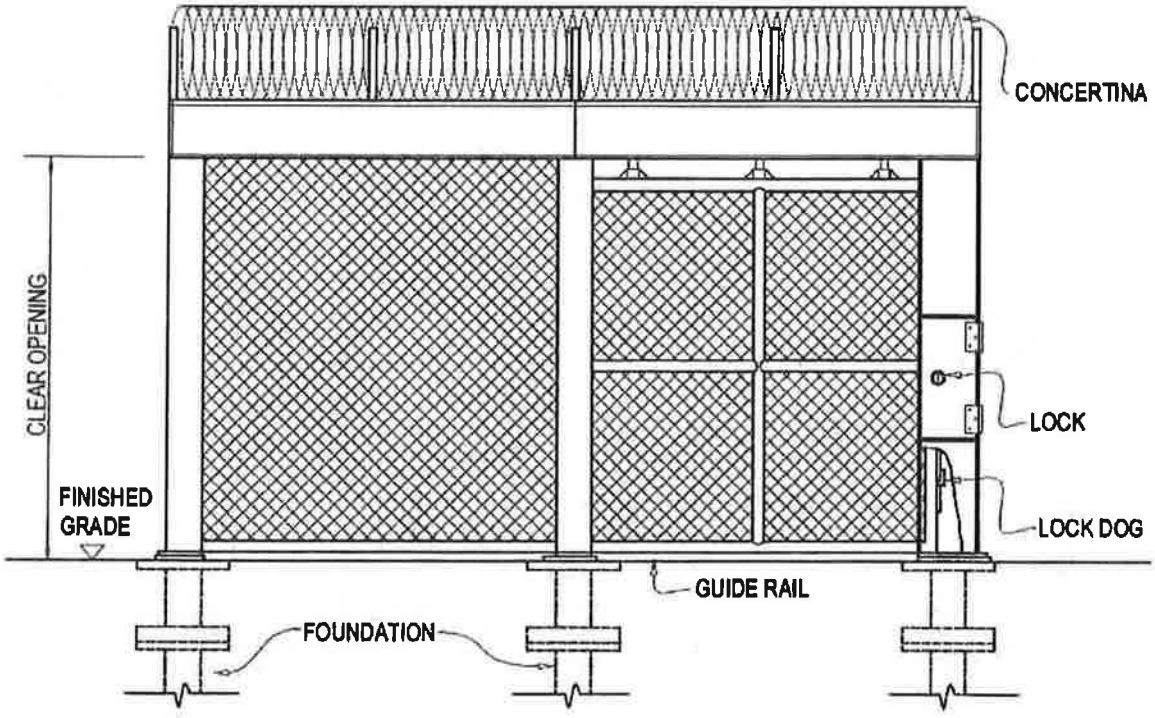

TO PARKING LOT
FLAG POLE
915
4250
CONCRETE SIDEWALK
4.0m W x 4.5 H
SLIDING GATE
10500
Pedestrian
route
CONTROL
POST
GATE HOUSE
PAVED AREA
23000
7500
3700
4.0m W x 4.5 H
SLIDING GATE
1.2m x 2.1m
SWING GATE
INSTITUTION SIDE

PLATE SP–3–1 – TYPICAL SALLY PORT ARRANGEMENT

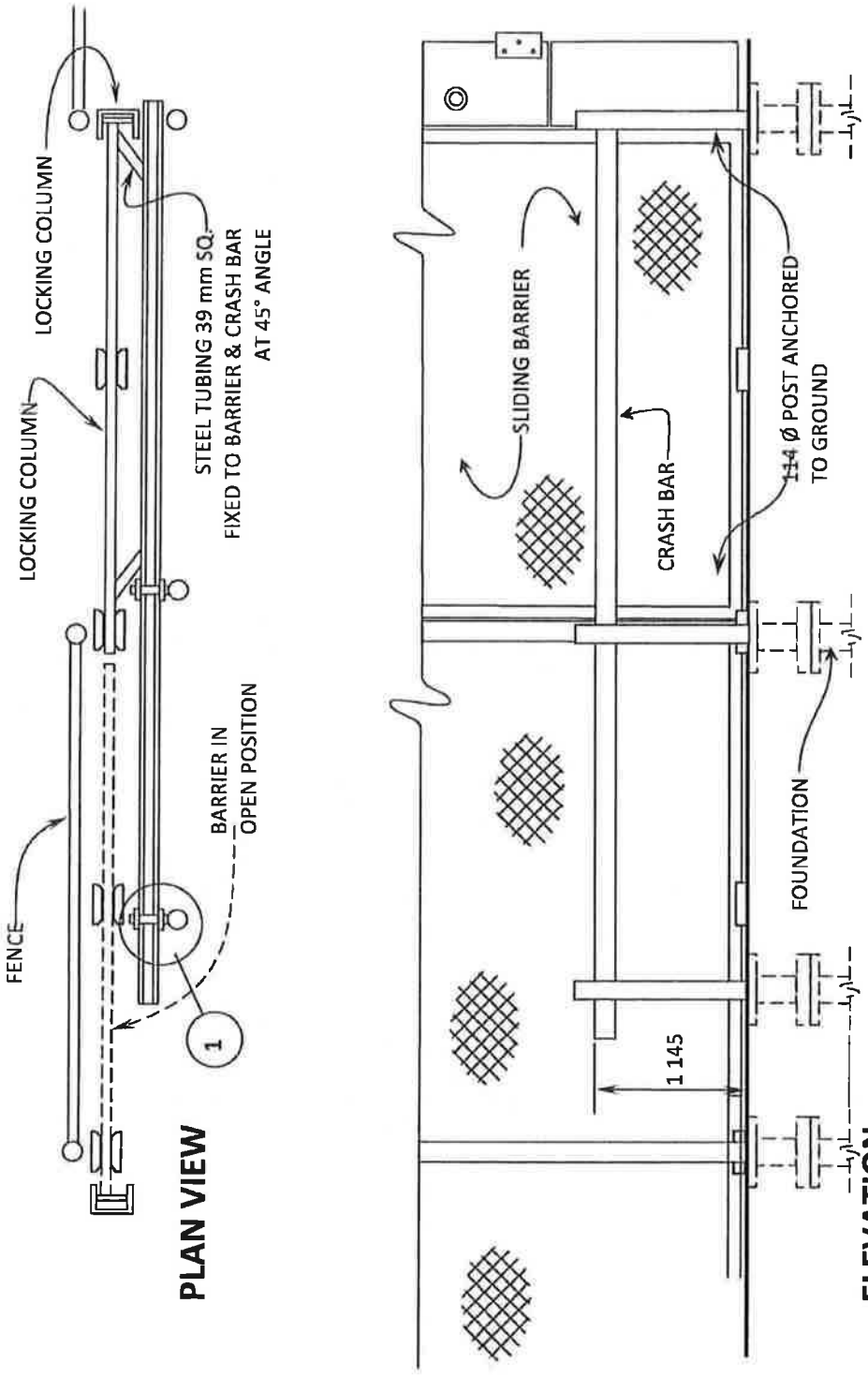


TOP VIEW



FRONT VIEW

PLATE SP–3–2 – FENCE GATE WITH OVERHEAD RACK – INNER PERIMETER FENCE



SP–3–3 – FENCE GATE WITH OVERHEAD RACK – EXTERIOR PERIMETER FENCE

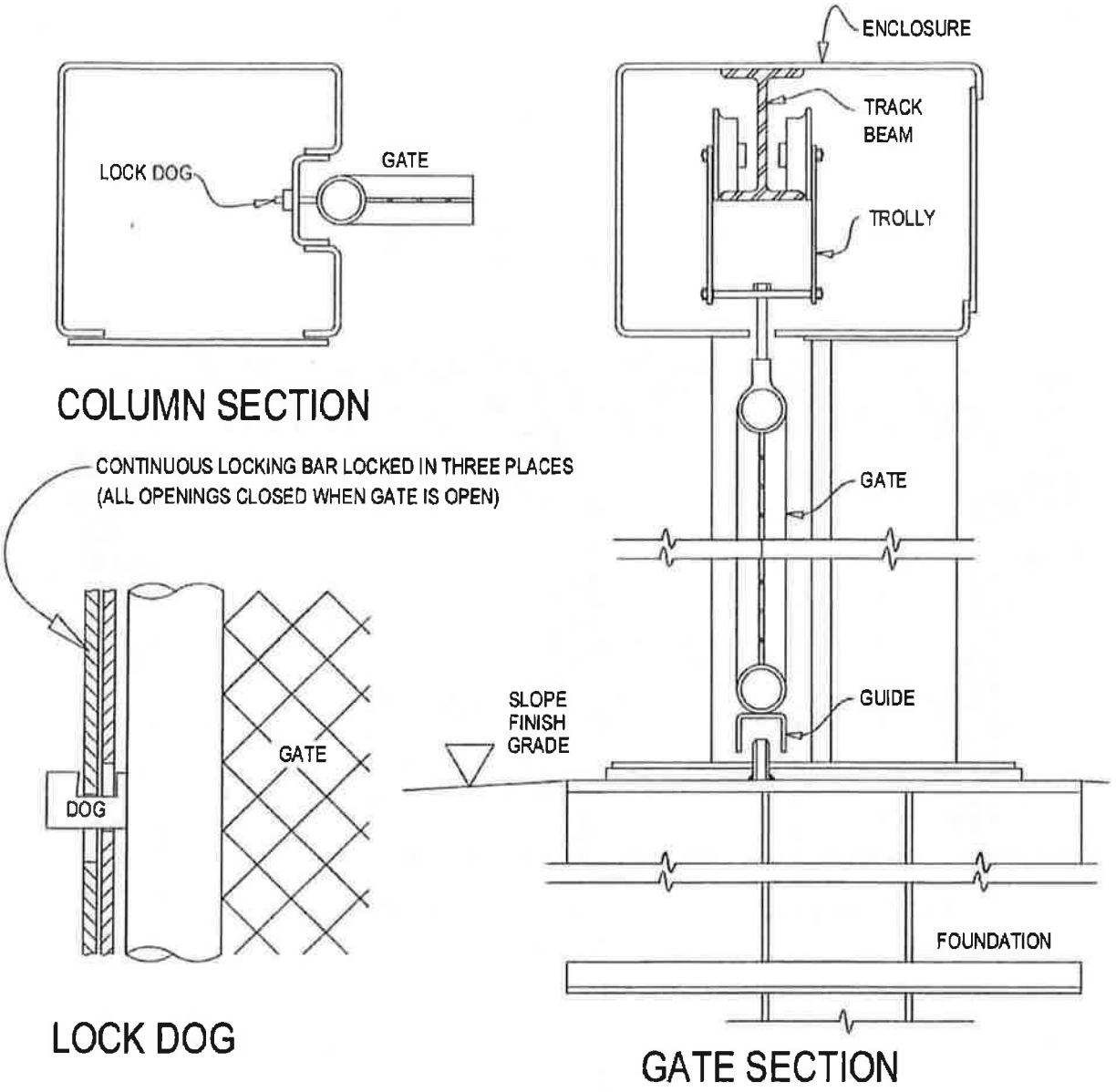


PLATE SP–3–4 – FENCE GATE WITH OVERHEAD RACK – DETAILS

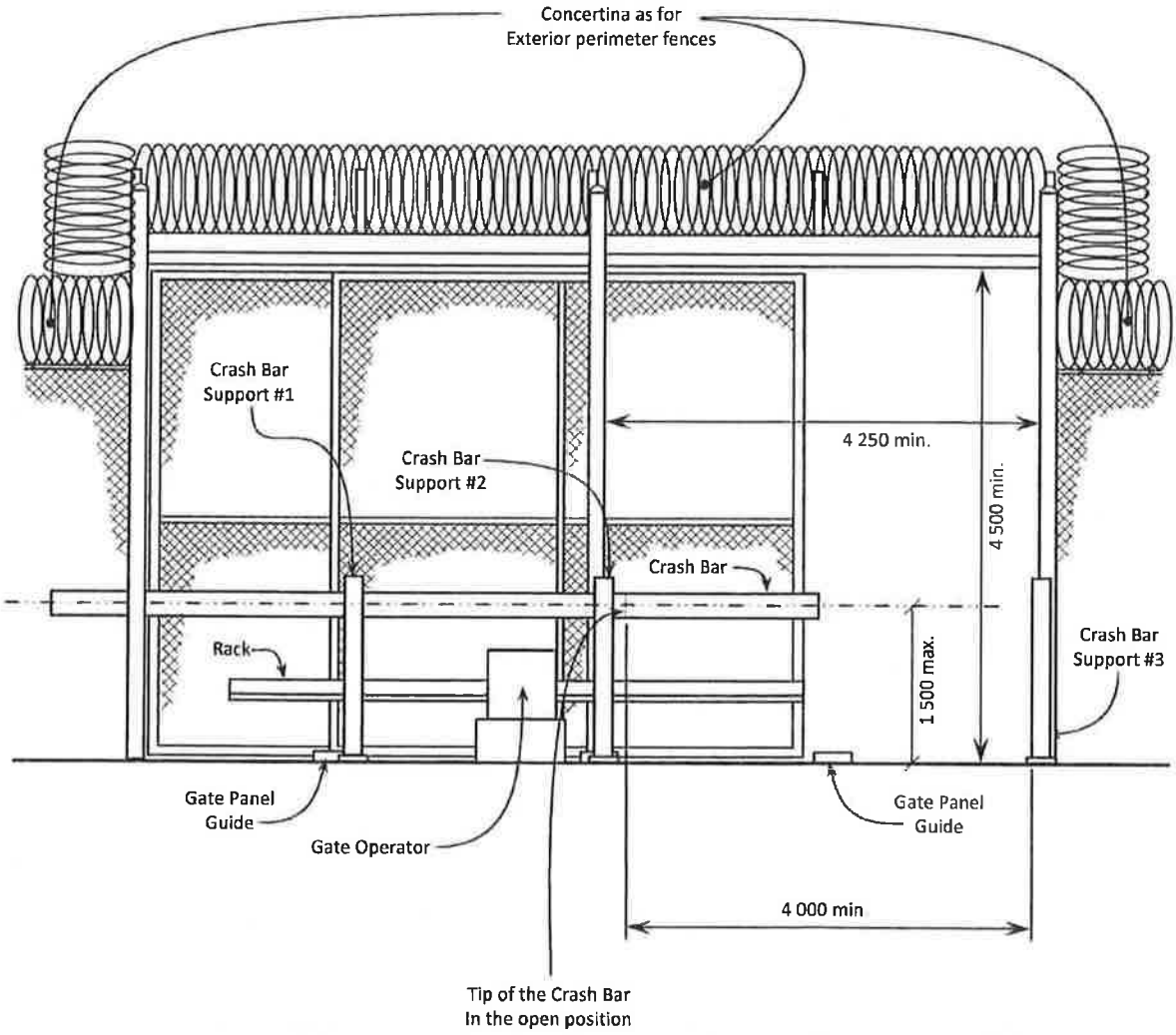


PLATE SP–3–5 – FENCE GATE WITH RACK & PINION – INSIDE ELEVATION OUTER PERIMETER FENCE

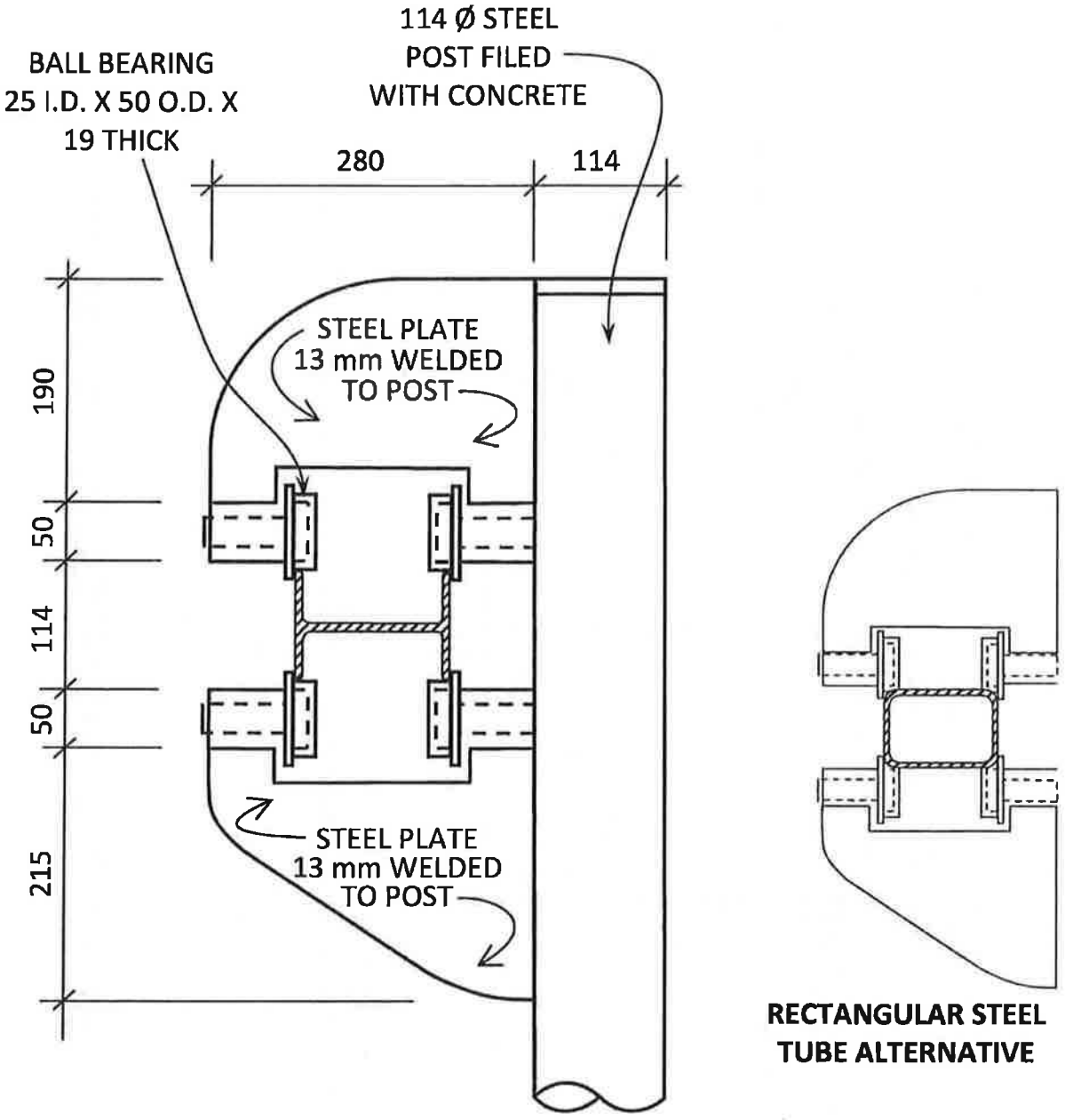


PLATE SP–3–6 – CRASH BAR DETAILS

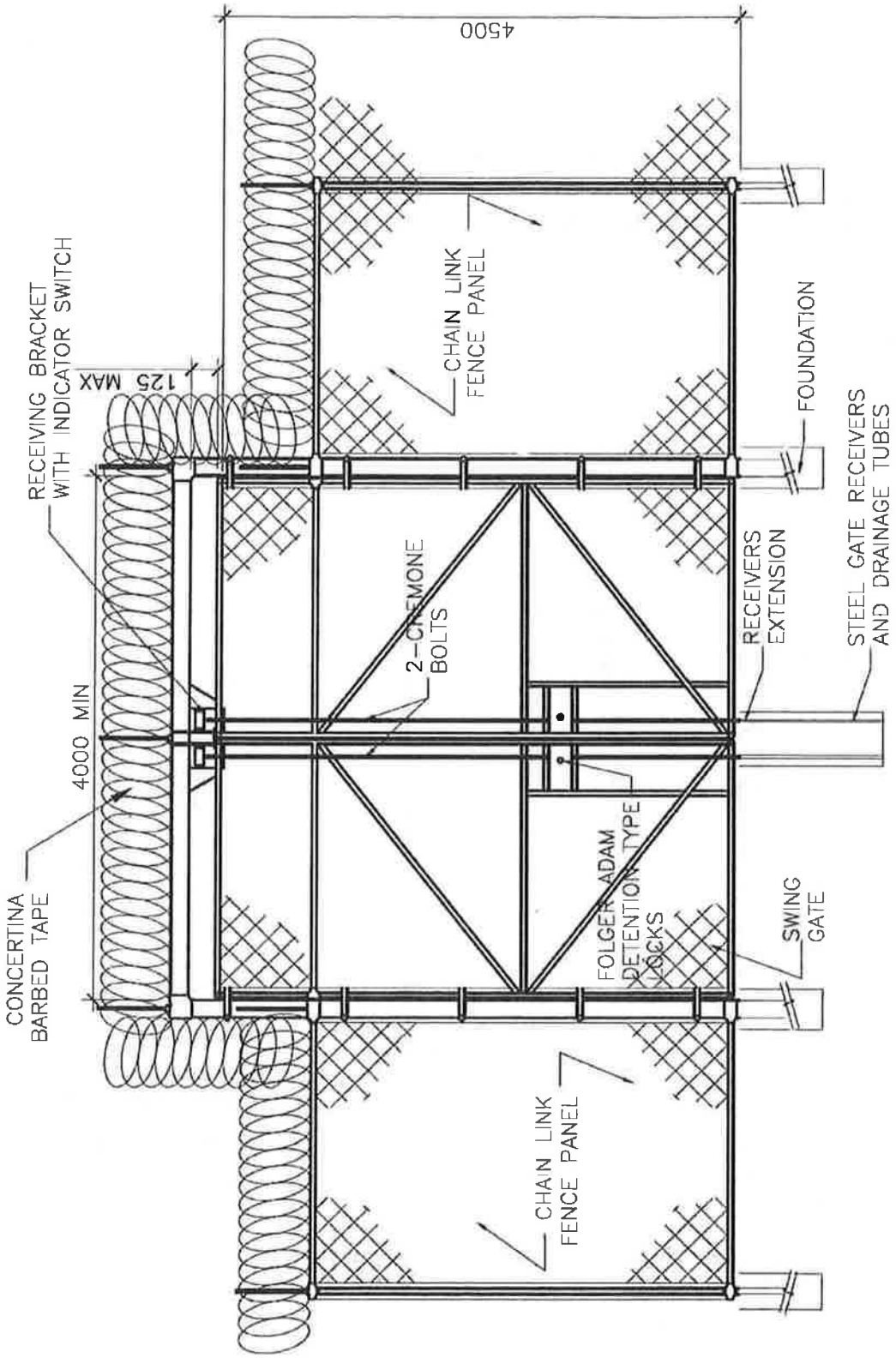


PLATE SP–3–7 – VEHICLE SWING GATE (EMERGENCY GATE)

SP-4 SITE – EXTERIOR LIGHTING

1. SCOPE

This section outlines the requirements for site lighting including perimeter fence lighting and provides design guidelines for the following:

- Type of lighting systems and standards.
- Recommendations for lighting levels.
- Quality of illuminance.
- Recommendations for control of glare.
- Recommendations for uniformity and brightness control of the environment.
- Recommendations for maintenance of the lighting system.

2. RELATED SECTIONS

SP–2 – Fences
SP–5 – Traffic Circulation
E–1 – General Electrical Engineering and Electrical Distribution
E–7 – Emergency Electrical
ST–1 – Guard Towers

3. GENERAL REQUIREMENTS

3.1 Design exterior lighting to preclude glare, at least to minimize glare in the eyes of guards, and compatible with the architecture of the building and with each other.
Enable the CSC Staff and Inmates to move in safety in designated areas, as identified on a project specific basis.
Assist the Staff in the visual detection of attempts to escape.

3.2 Exterior lighting should be so designed as to minimize light entering sleeping spaces.

3.3 All exterior lighting systems will be designed so that systems will supplement each other, free of shadows or dark spots, to provide silhouetting for surveillance purposes and to facilitate observation from strategic areas.

3.4 Energy saving features are to be used in accordance with government policy.

3.5 Use the PWGSC Standard on graphic symbols for electrical drawings. Some of the symbols are publicly available on page 10 of the PWGSC National CADD Standard Supplement[5].

3.6 Reference to levels of illumination in this Document refer to average and avg./min. ratio values whether it is horizontal illumination at ground level or vertical illumination, unless otherwise stated. These are minimum values and special consideration may be necessary to compensate for local and adverse atmospheric conditions.

3.7 Lighting is not used alone to deter or detect attempts to escape by inmates. It must therefore be compatible with and complement other methods applied, such as T.V. monitoring, alarms systems, observation towers, vehicle patrol, etc.

3.8 Design the systems to withstand a wind velocity of 160 km/h and ice loading characteristic of the area in which the institution is located.

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5 PWGSC National CADD Standard Supplement – National Capital Area Operations – Professional and Technical Services, March 2010
http://www.tpsgc-pwgsc.gc.ca/cdao-cadd/cn-nc/dossiers-files/PWGSC_CADD_Standards_NCA-OPS-Supplement-E_v1.1.pdf

3.9 Provide automatic control and manual override for all security lighting systems. The manual override shall reset itself to the automatic operation after it has been left in the manual position for 24 hours. The recreational lighting control shall be manual only.

4. APPLICATIONS

Exterior lighting is designed to provide illumination of the following:

- Signs
- Entrances, including exterior stairways and ramps.
- Pedestrian walks.
- Grounds.
- Parking lots and roadways.
- Outdoor recreation areas.
- Roof maximum security institutions only.
- Perimeter fence.

5. PERFORMANCE REQUIREMENTS

5.1 Security Lighting

5.1.1 Location and Connection to Emergency Power Source

The following are security lighting systems and as such they shall be connected to the emergency power source.

5.1.1.1 Perimeter Fence Lighting System – Due to the special requirements of the perimeter system it is covered in detail under section 5.2.

5.1.1.2 Building roof for Maximum institutions. These areas are to be illuminated to 10 ℓx. This level of illumination is intended to provide silhouetting for surveillance of building roofs when required.

5.1.1.3 Medium and Maximum institution areas bounded by security fences are to be illuminated to 10 ℓx to allow silhouetting surveillance. This includes the entire area within the Inner Perimeter Fence.

5.1.2 Illumination

5.1.2.1 Entrances and Sallyports should be illuminated so that the security officers may observe and recognize visitors who wish to enter the institution or leave during hours of darkness. No fixture should be mounted where it can direct light into the officers' eyes and thus reduce their ability to see the person wishing to pass through. Entrances and Sallyports should be illuminated to the same level of intensity as the perimeter fence with supplementary lighting installed and operated only as required.

5.1.2.2 The security lighting system should ensure that the areas directly illuminated are brighter than the immediate surrounding areas.

5.1.2.3 Glare Control – Where control of spill light becomes necessary due to glare experienced after the installation is completed; specify that Contractor mount shields or visors on the luminaires, providing the required "cut off" for glare control. Where visors are used the luminaires must be so designed that they can be attached simply, quickly and securely without affecting the strength of the luminaire. A careful study of the geometry of the lighting system during the design

stages should be undertaken to determine where spill light might produce a problem. Ensure that the minimum illumination levels are not affected.

5.1.2.4 Uniformity – The placement of the luminaires should be arranged so as to ensure good uniformity of illumination over the area illuminated. Uniformity is expressed as the ratio of average illumination to minimum. In the area between fences the ratio should not exceed 3:1 Medium and Maximum Institutions. Adherence to the layout shown in references will permit achieving the desired results.

5.1.2.5 Luminaires – Exterior security lighting fixtures shall be based on the following requirements:

a) Shatterproof lenses and vandal resistant housings.
b) Non yellowing lenses.
c) Post, luminaires and brackets capable of withstanding the force of 160 km/h wind.
d) Specify that exterior lighting fixtures be located so as to facilitate replacement of components and to minimize vandalism.
e) Use high mast type of fixture for roof lighting, entrances, etc. wherever possible to minimize glare.

5.1.2.6 Electrical System – The electrical system must meet the following minimum requirements.

a) The security lighting system including the perimeter fence lighting shall be connected to the standby power system to ensure the greatest continuity of service.
b) Grounding methods shall meet the requirements of the Canadian Electrical Code, *CSA C22.1-09*[6].
c) Design the systems so that each phase is protected by its own single phase circuit breaker. This is to prevent the possibility of a fault on one phase affecting the other two.

5.1.2.7 Codes and Standards – The essential requirements and minimum standards for the installation of Double Fence Lighting are established by the latest edition of the Canadian Electrical Code, Part 1, *CSA C22.1-09* (see footnote 2) and any local or provincial regulations which may apply. Under no circumstances, however, shall the requirements of the present Document be reduced.

5.2 Perimeter Fence Lighting

5.2.1 General

5.2.1.1 Security Lighting for Perimeter Fences shall be designed to accomplish the following:

a) Discourage or deter attempts to escape by inmates.
b) Make detection certain should an escape be attempted within the immediate area of the perimeter fence.

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6 CSA C22.1-09 -- Canadian electrical code, part I (21st edition), safety standard for electrical installations.

c) Avoid glare that can dazzle the security staff and annoys street and highway traffic, marine and railroad operations, and the surrounding area.
d) Provide high system reliability.
e) Provide the levels of illumination indicated in Plates SP-4-2 and SP-4-6.
f) Provide automatic control.
g) Consist of poles, lighting equipment and components located outside the double security fences and being made inaccessible to persons attempting malicious damage to the equipment.
h) Be connected to the standby power system to ensure the greatest continuity of service.
i) Provide a monochromatic light source -- a doublet of 589 nm and 589.6 nm for TV surveillance of the area between and adjacent to the double fences.
j) Provide minimum illumination level of 10 ℓx to the exterior edge of the perimeter road (typically between 5 m and 15 m from the bottom of the light poles).

5.2.2 Design

Design the Perimeter Fence Lighting System and specify equipment and components to achieve and maintain lighting quality based on the following factors and considerations:

5.2.2.1 Take into consideration the fact that the amount of illumination required at night to see a person in detail is higher than the amount required to see a person silhouetted against a light background in daytime. Many institutions are located in areas well removed from cities and towns and the security officers have to see escapees silhouetted against a dark background of trees, grass or buildings. It is necessary, therefore, to provide sufficient light to enable the potential escapees to be seen in detail within the area defined by the perimeter security fence.

5.2.2.2 The height of the perimeter fences, 3.6 m (12'), and the distance between fences, 7.5 m (24.6'), and the height and physical arrangement of sentry outposts and/or guard towers, are important factors to be considered in the design of the applicable security lighting system. These factors dictate the height of the poles, the mounting height of the luminaries and the installation methods to be used. Refer to Plates of this Document for the required illumination levels.

5.2.2.3 Plates SP-4-2 & SP-4-6 present maintained levels of luminance within the illuminated areas at ground level. They would occur when the fixtures are dirty and the lamps are at their lowest output approximately 80% of their rated life. A suitable maintenance factor should be included in the design calculation to make allowance for luminaire dirt, depreciation and lamp lumen depreciation. Weather conditions prevailing in the area may also adversely affect visibility so in a predominantly foggy area the level of illumination should be increased

or a factor applied in the calculation to ensure that under poor visibility conditions (say light fog) the vision of the security staff can be assisted by the lighting system.

5.2.2.4 Local conditions such as positions of cameras etc. may require rising and/or increasing the number of fixtures required in certain areas to accommodate the camera viewing. Special attention must be paid in the double fence corner area.

5.2.3 Luminaires

5.2.3.1 Luminaire type – Low Pressure Sodium or Light Emitting Diode (LED) array are the two choices Perimeter Fence Lighting. The luminaire must be fully operable between -40°C (or less) and + 50°C (or more).

5.2.3.2 Sodium-type Luminaires, Lamps and Ballasts – When Sodium type of lamps are selected for the catenary system, considers the following requirements:

a) Luminaire to accommodate one 135 W SOX low pressure sodium lamp, operated from a remote ballast. Use Philips SDP 828 or approved equal.
b) Specify a luminaire with a "unitized" cast aluminium housing free of welds, butt joints and lapped corners having a baked enamel finish, and an anodized aluminium reflector and a clear acrylic refractor.
c) Specify a Type HRC fuse rating to be as specified by the ballast manufacturer and to be installed in the transformer base for the protection of each luminaire.
d) Specify luminaire having stainless steel hardware on the outside and corrosion resistant finish of all materials inside the fixture.
e) Specify a luminaire having an optical system protected by a neoprene gasket to keep out dust and moisture.
f) Specify guard for protection against excessive vibration by using a porcelain lampholder and a spring steel plastic coated lamp support.
g) Specify each luminaire to have a 135 W SOX low pressure sodium lamp in a T-21 bulb providing 21,500 lm output (minimum) and an average rated life of 15,000 hours.
h) Specify ballasts designed and manufactured to meet *CSA C22.2 No. 74-96 (R2005)*[7], *ANSI Standard C82.1-2004*[8] and CBM Standard. Rated voltage to match supply voltage should be specified to match current and voltage ratings of the lamps they are designed to operate. Ballasts to have a power factor correction to 90% or more.
i) Specify ballasts designed to operate 135 W low pressure SOX sodium lamps at minus 40°C and to maintain lamp wattage within 8% of nominal with a supply line fluctuation of 20%.
j) Specify ballast of constant wattage auto transformer type.

7 CAN/CSA-C22.2 No. 74-96 (R2005) – Equipment for Use with Electric Discharge Lamps

8 ANSI C82.1-2004 – American National Standard for Lamp Ballasts – Line Frequency Fluorescent Lamp Ballasts

5.2.4 Poles

5.2.4.1 Specify octagonal tapered steel poles complete with transformer bases, eye bolts and a gasketed electrical outlet boxes.

5.2.4.2 Specify poles to be hot dipped galvanized on both interior and exterior surfaces as per *ASTM A123–09*[9].

5.2.4.3 Specify pole height and luminaire spacing as shown on Plates SP-4-3 & SP-4-7 at the end of this section. Specify hot dipped galvanized anchor bolts and hardware accessories where possible.

5.2.4.4 Specify a (hardwood plywood template for retaining anchor bolts when grouting them in place in the concrete base.

5.2.4.5 Specify a non-shrink grout.

5.2.4.6 Ensure that the transformer base plates are drilled in the manufacturer's plant to match the anchor bolt configuration sets in the bases.

5.2.4.7 Ensure that the access doors in the transformer bases are gasketed and use tamperproof hardware for securing doors in place.

5.2.4.8 Specify that the transformer base be oriented so that their access doors are parallel to but facing away from the fence.

5.2.4.9 Specify yellow PVC guards to be installed on the guy wires on the anchor poles terminating the linear sections of the spans.

5.2.4.10 Workmanship (Poles) – Specify that all castings and steel fabrication be made in a good workmanship like manner. Specify that Contractor employs properly qualified and certified welders, and that after all welds are made, cut edges, projections or sharp corners and edges be ground to a smooth surface prior to finishing and that the poles and transformer bases be thoroughly cleaned.

5.2.4.11 Shipment and Delivery (Poles) – Specify that the poles and transformer bases, complete with all hardware, be suitably packaged to provide adequate protection and that all components be shipped and delivered as a unit. Poles should be supported throughout their length during transportation and when stockpiled must be supported so that they are not bent under their own weight. Specify the use of wooden block supports if necessary.

a) Grounding Requirements (Poles) – Specify that a 10 mm threaded copper grounding stud be welded to the inside of each transformer base at the back and above the bottom of the door opening. Ensure that ground studs are supplied each complete with two nuts, one lock washer and one copper clamp type lug for minimum 13 mm^2 stranded bare copper wire.

b) Specify that the ground studs be welded to the transformer bases in such a manner as to present a smooth surface on the exterior of the bases.

[9] ASTM A123 / A123M – 09 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products (CSA G164 has been withdrawn)

5.2.4.12 Markings – Specify that each pole has an aluminium nameplate located one foot above its base. The nameplates are to include the manufacturer's name or identification mark, year of manufacture, pole length and ordering reference number.

5.2.4.13 Shims – Specify that each pole be provided with one 1.5 mm shim and two "U" shaped 3 mm shims for levelling.

5.2.4.14 Pole Installation – In designing and specifying the pole installation consider the following requirements and sequence:

a) The poles should be stripped of the wrappings only after they have been transported to the site and are ready for erection.

b) The transformer bases must be mounted first on the concrete bases and then the poles are to be erected and mounted on the transformer bases in the following manner:

i. Before erection, the bottom of the transformer bases and the bottoms of the pole bases should be coated with at least two coats of bituminous paint. Coating must be free from imbedded impurities.

ii. The transformer bases should be bolted to the concrete foundations.

iii. Conductor cables should be pulled into the transformer bases.

iv. The poles should be lifted onto the transformer bases orienting same to ensure that eye bolts and electrical outlet boxes are in the correct positions.

v. The anchor bolts should be installed and one flat washer placed beneath each nut.

vi. The shims supplied with each pole should be inserted between the pole base and the transformer base to level the pole to a vertical position.

vii. Spirit level or surveying instrument should be used.

viii. The anchor bolts should then be tightened down with a torque wrench to a torque as specified by the Manufacturer.

ix. Specify that Contractor installs and connects ballasts in transformer bases and draws conductors through electrical outlet boxes in poles.

5.2.5 Catenary System

Base the lighting design on an axially suspended catenary system as shown in Plate SP–4–3. In specifying the catenary system, consider the following requirements:

5.2.5.1 Specify identical steel poles throughout the Project for suspended catenary system and of sufficient strength to support a suspended cable system as described herein. The system shall be capable of withstanding a wind velocity of 160 km/h and ice loading characteristics of the area and a luminaire dead weight of not less than 9 kg (20 lbs) and a projected area of 0.3 m^2 (3 sq. ft.)

5.2.5.2 Maintain total linear balance by anchoring the terminal poles of each linear section as shown in Plates SP-4-4 & SP-4-5.

5.2.5.3 The catenary (upper) and the messenger (lower) cables should be 3/8" nominal diameter.

5.2.5.4 The strainer (vertical) and suspension cables should be a minimum 1/8" diameter stainless steel.

5.2.5.5 Wind the electrical cable assembly spirally around the messenger cable. Electrical cable shall be XLPE insulated stranded copper conductors in multi cord cable assembly with overall PVC jacket.

5.2.5.6 In Medium and Maximum Institutions there are three luminaires in each span of 30 m as shown in Plates SP-4-2 and SP-4-3. The result is a luminaire every 10 m.

5.2.5.7 Specify that Contractor installs the catenary system and allows it to follow its natural curve as closely as possible, so that the distance between the catenary and messenger cables will be the minimum at the centre of each span.

5.2.5.8 All hardware including turnbuckles, wire rope, clamps, etc., should be hot dipped galvanized steel.

5.2.5.9 Each 30 m span of the suspended system should be assembled on the ground then raised and terminated at each consecutive pole. Consult the manufacturer for an application/installation manual for the Catenary Lighting System.

5.2.6 Pole Mounted Luminaires and Lamps

5.2.6.1 Specify that luminaires shall be mounted with a tilt angle of 15° around the longitudinal axis.

5.2.6.2 Specify submission of photometric information, based on performance testing by an independent testing laboratory data to be plotted to scale and produced in form in accordance with current I.E.S. and North American practices.

5.2.7 Controls

Perimeter fence lighting shall be controlled by a photoelectric cell and meet the following requirements:

5.2.7.1 A photo sensitive light control shall automatically turn on the security fence lighting system.

5.2.7.2 The unit should be mounted on an adaptor on a fence lighting pole located in front of the Administration Building.

5.2.7.3 A weatherproof enclosed unit shall be provided which will be unaffected by humidity. It should be capable of operating over a range of -60°C to +55°C.

5.2.7.4 The control should prevent the lighting from being energized during the daylight hours but should energize the lamps on a preset (adjustable) value.

5.2.7.5 A manual control to turn the lights off when the level of natural light rises to a desired level shall be provided. The manual control must provide control override to turn the lights on for emergency.

5.2.7.6 The unit should operate to "fail safe" in the event of failure of any component of the controller. In event of such a failure the lamps should remain energized.

5.2.7.7 Design the photo control to be connected in parallel with the "ON" contacts of the "ON OFF" selector switch mounted in a location such as the gatehouse etc., which controls the exterior security lighting system at the institution.

5.2.7.8 The photo control shall have a standard NEMA twist lock plug.

5.2.7.9 The photocell shall be temperature stabilized pre-aged and humidically sealed.

5.2.7.10 The installation Contractor shall adjust the photo control unit to switch on at not less than 40 ℓx at 120 volts. The unit should be rated 1000 W incandescent, 120 volts, 60 HZ and CSA approved.

5.3 Other Exterior Lighting

5.3.1 Luminaire type

High Pressure Sodium, Metal Halide, Mercury Vapour or Light Emitting Diode (LED) array are the choices for Recreational Areas, Parking Lots, Approach Roads and Collector Lanes. The luminaire must be fully operable between -40°C (or less) and + 50°C (or more).

5.3.2 Recreational Areas

5.3.2.1 The recreational illumination system shall be installed on a project specific basis so as to form an integral system as part of the exterior lighting system. Where this is not identified, spare capacity may be provided for future use subject to C.S.C. approval. In general, illumination levels for recreational purposes are approximately 70 ℓx.

5.3.2.2 Illumination levels for the following recreational activity areas are (Total Area 22,736 m^2, see Plate 2 for typical layout):

a) Softball Diamond - 18 x 18 m overall with 73 m outfield radius, Infield 100 ℓx, outerfield 70 ℓx.

b) Hockey Rink - 60 x 26 m superimposed on softball area where weather permits, 100 ℓx.

c) Running Track – 112 m x 203 m, 50 ℓx

d) Small games as established on a project specific basis; area as required and illuminated to a maximum of 100 ℓx.

5.3.3 Parking Lots, Approach Roads and Collector Lanes

5.3.3.1 Average Illumination Levels (minimum maintained values)

- Parking Areas - 10 ℓx
- Approach Roads - 20 ℓx
- Collector Lanes, Exits and Entrances - 13 ℓx

5.3.3.2 Light Source – Because of its higher efficacy high pressure sodium is preferred with metal halide as an alternative.

5.3.3.3 Illumination Uniformity – Maintain a maximum ratio of average lux to minimum lux of 3:1.

5.3.3.4 Illumination Quality – To minimize shadows especially between parked cars illuminate each point from at least two luminaire locations.

5.3.4 Controls

5.3.4.1 The recreational lighting controls must be such that the lighting is switched on manually when needed, the controls are located so that

security staff can switch off the lights whenever they interfere with their own or the camera's vision.

5.3.4.2 Design other exterior lighting to be controlled by photo cell or astronomical dial time clock with manual bypass feature at a location such as the gatehouse etc. Design to include separate zones for parking lots, for exterior signs and for building periphery.

5.3.5 Poles and Masts

5.3.5.1 Specify that all poles and masts used as light standards shall be fabricated from steel conforming to *CSA Standard G40.21-04 (R2009)*[10] Type T, grade 60T, Low silicon, 60,000 psi yield strength. Do not use concrete poles and masts.

5.3.5.2 Avoid having steps on poles and masts.

5.3.5.3 Minimum height of post for pedestrian walks 3.05 m, for parking lots 6.1 m.

5.3.5.4 The lighting system should incorporate a method by which luminaires on high standards (poles) may be easily and economically maintained.

5.3.5.5 High Standards (30 m poles) are not necessary for Minimum Institution but the pole height should be less than 13 m.

5.4 Maintenance

Develop and specify a plan, and review with User, to ensure that the following will be done at regular intervals:

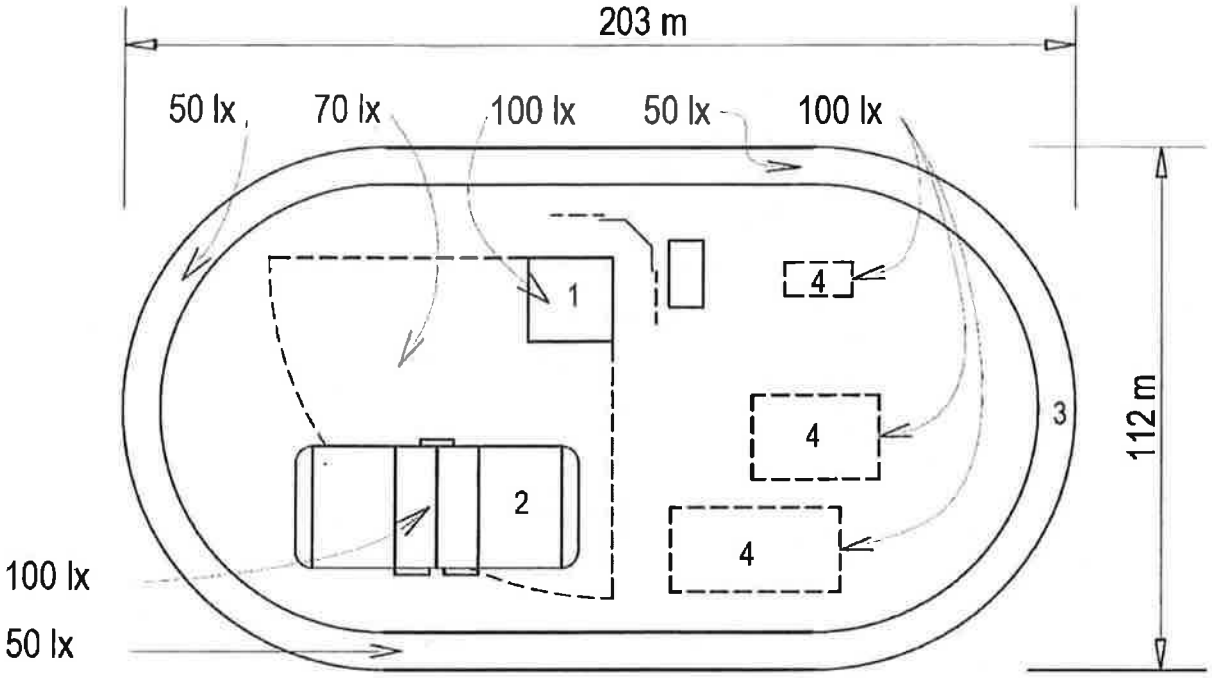
5.4.1 Lamps and luminaries cleaned annually.

5.4.2 Lamps replaced immediately when they fail.

5.4.3 All lamps replaced, on the basis of a developed group lamp replacement plan, at say 80% of lamp life which should occur every two years. This will ensure that there will be a minimum number of lamp outages during a two year period. With this type of plan the lamps which do burn out are spot replaced as soon as detected and these lamps should be marked and the date of replacement recorded so that at the time of "group relamping" they can be retained for use as future spot replacements.

5.4.4 During the first full year of operation arrange to have the cable system inspected at mid summer and mid winter and adjustments made to provide the proper tension on the suspended cable system.

[10] CSA G40.20-04/G40.21-04 (R2009) – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

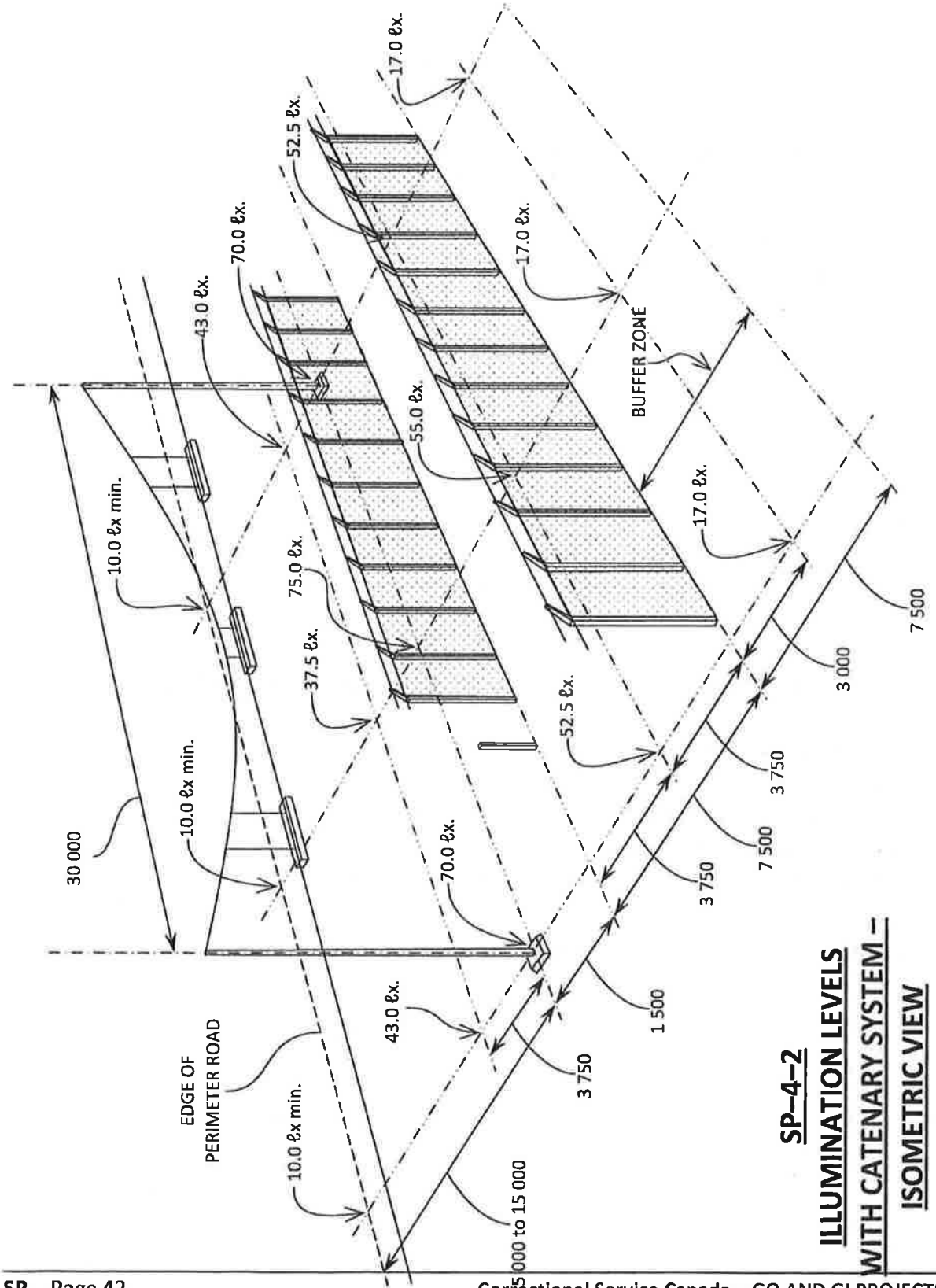


ALLOCATION FOR ILLUMINATION AND LIGHTING LEVELS

1. SOFTBALL DIAMOND 18 X 18 – 73 m OUTFIELD 4 183 m^2 (100 ℓx INFIELD, 70 ℓx OUTFIELD)
2. ICE HOCKEY RINK 60 X 25 m, 155 m^2 (100 ℓx)
3. TRACK LENGTH NON-STANDARD (50 ℓx)
4. SMALL GAMES – VARIOUS, TOTAL 1 343 m^2

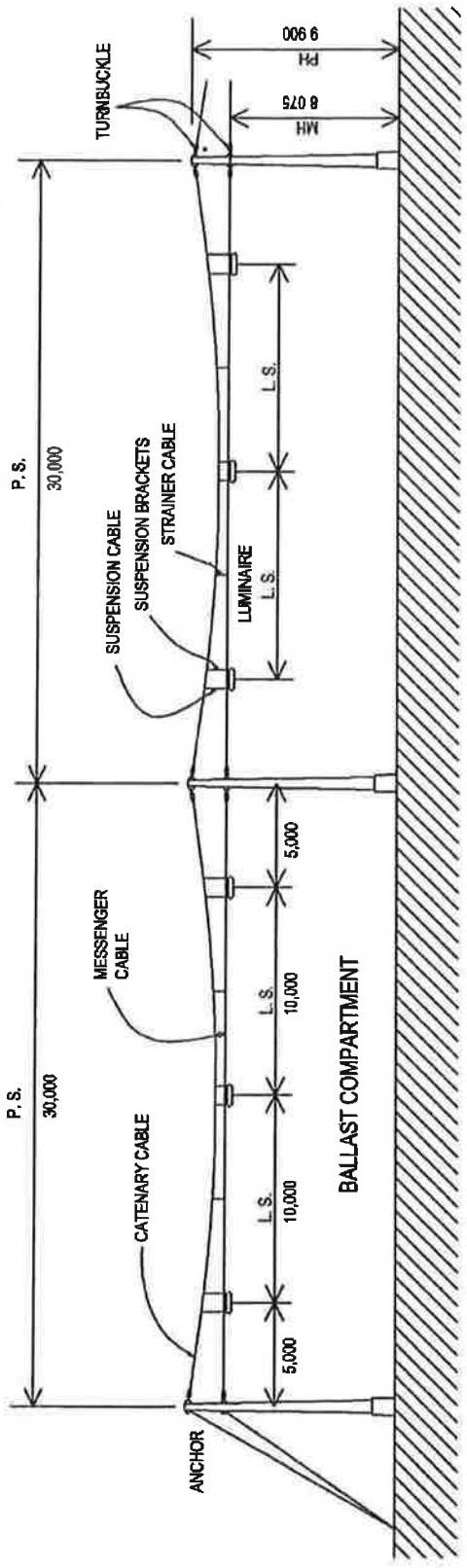
APPROXIMATE FIELD SIZE 22 736 m^2

SP–4–1 – ATHLETIC FIELD LIGHTING



SP–4–2

ILLUMINATION LEVELS WITH CATENARY SYSTEM – ISOMETRIC VIEW



LEGEND

P. S. - POLE SPACING
L. S. - LUMINAIRE SPACING
P. H. - POLE HEIGHT
M. H. - LUMINAIRE MOUNTING HEIGHT

SP–4–3 – CATENARY SYSTEM – SIDE VIEW

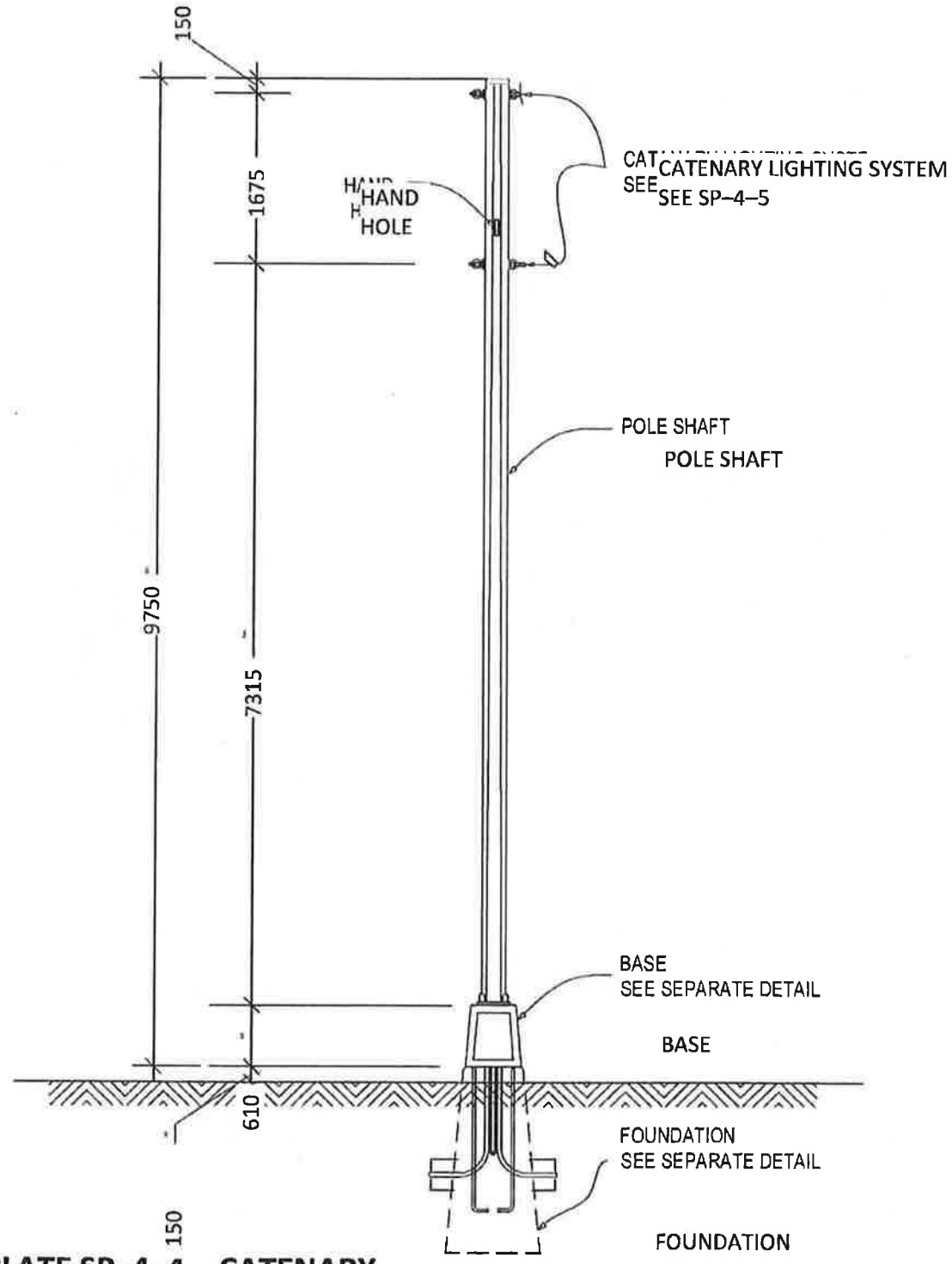
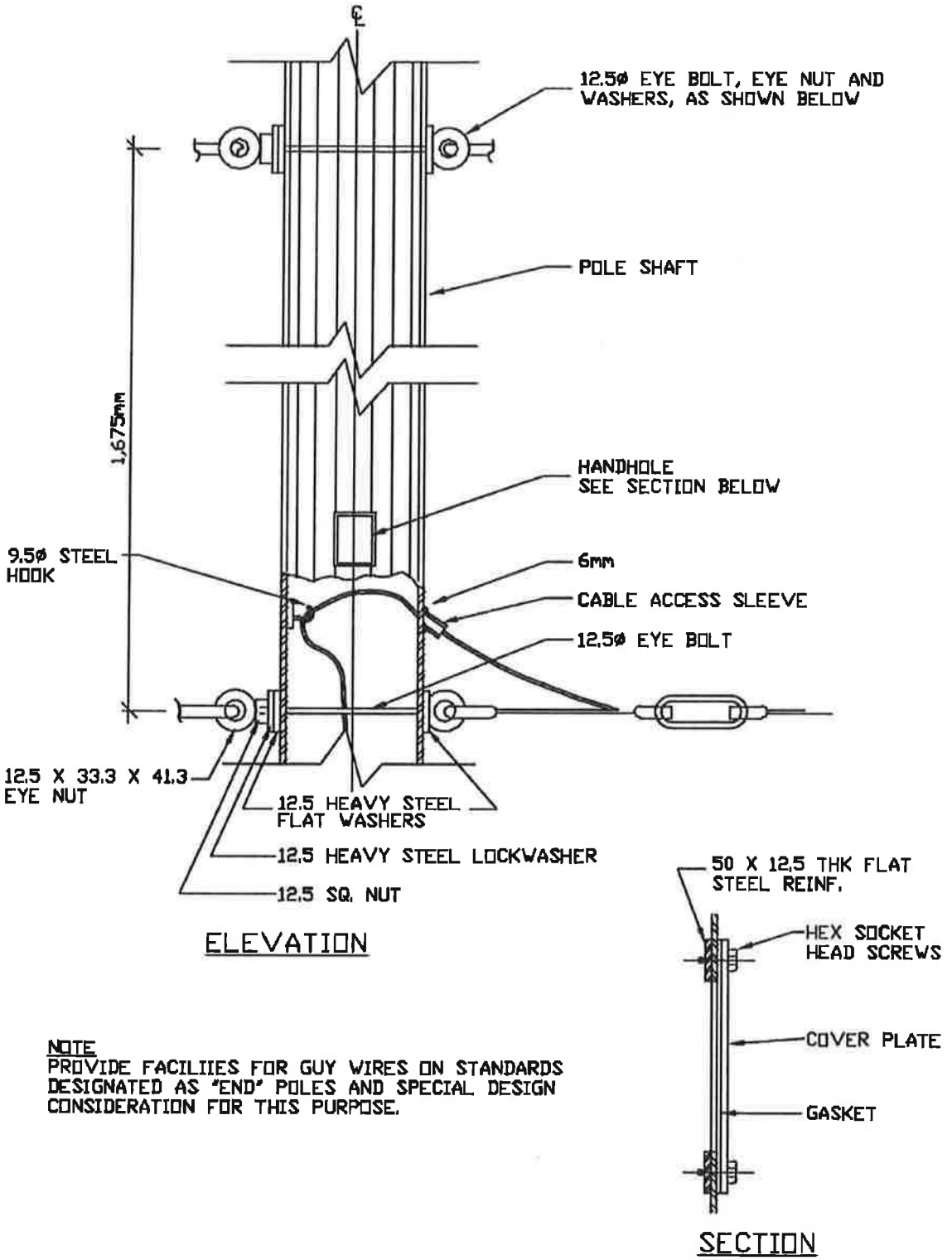
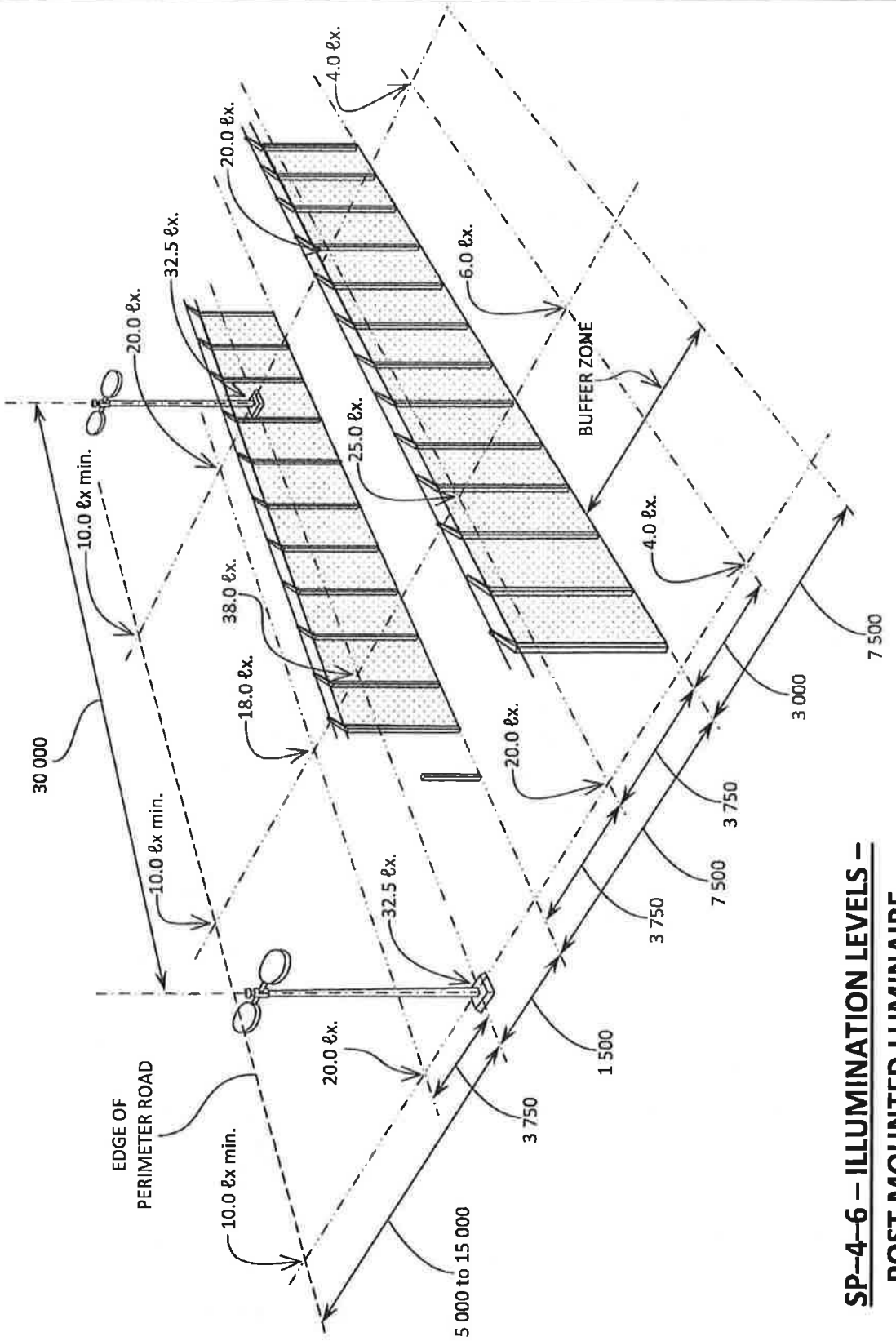


PLATE SP–4–4 – CATENARY SYSTEM – POST – ELEVATION



NOTE
PROVIDE FACILIIES FOR GUY WIRES ON STANDARDS DESIGNATED AS 'END' POLES AND SPECIAL DESIGN CONSIDERATION FOR THIS PURPOSE.

SP–4–5 – CATENARY SYSTEM – POLE DETAIL



SP–4–6 – ILLUMINATION LEVELS – POST MOUNTED LUMINAIRE – ISOMETRIC VIEW

SP-5 SITE – TRAFFIC CIRCULATION AND PARKING

1. SCOPE

This section outlines requirements for vehicle and pedestrian circulation and for vehicle parking inside and outside correctional institutions.

2. RELATED SECTIONS

SP–1 – Site Development
SP–2 – Security Fences
ST–1 – Guard Towers
SP–3 – Gates/Sallyports
SP–4 – Lighting

3. CIRCULATION SECURITY REQUIREMENTS

3.1 Outside the Institutional Perimeter

3.1.1 For ease of control, there shall be only one roadway providing access to the institution from a public thoroughfare.

3.1.2 All parking, including that of staff, visitor and CSC owned vehicles, shall be located on the exterior of the institution and in proximity to the Principal Entrance.

3.1.3 A dedicated perimeter patrol road shall be provided which will allow a fast staff response and which will have a minimum number of crossings; this road shall also be used for access into the institution via the Emergency Vehicle Entrance as well as for the use of maintenance vehicles servicing perimeter lighting, fences, and cameras, where applicable.

3.1.4 Pedestrian walks shall only be provided from the parking area to the Principal Entrance.

3.2 Inside the Institutional Perimeter

3.2.1 A pedestrian circulation network shall connect all buildings. At the Maximum security level, the network may be fenced, covered or enclosed (unheated) for movement control. Consideration of enclosed networks must be based on security requirements only; they are not intended to provide shelter from the elements for pedestrian movements from one activity area to another.

3.2.2 Fire vehicle access shall be in accordance with applicable authorities. Two different access routes, one to the Principal Entrance, one to the Emergency Vehicle Entrance shall be provided with clear signage (see SP-3:3.2).

3.2.3 Vehicle roadways are required for operations, maintenance and food and material supply. Every effort shall be made to ensure that these do not interfere with inmate movement and that they are located away from outdoor inmate activity areas.

3.2.4 Vehicle loading and unloading zones shall be centralized where possible, or located in proximity to one another to facilitate their control. The loading zones shall be located away from inmate movement and exterior activity areas, and shall be close to the Principal Entrance or Service Entrance where applicable.

4. DESIGN REQUIREMENTS

4.1 Roadways (Other than Perimeter Patrol Road)

4.1.1 The access road shall be integrated into the public road system; it shall not provide a hazardous crossing nor cause undue congestion during peak hour movements.

4.1.2 All roads shall be asphalt paved unless local conditions dictate otherwise.

4.1.3 The minimum widths of paved surfaces shall be as follows:

- One way single lane: 3.5 m
- Infrequently used access ways: 4.8 m
- Two way double lane: 7.0 m

4.1.4 Roadway curbs shall not be used.

4.1.5 Drainage, turning radii, prepared shoulders and intersections shall conform to local municipal standards.

4.1.6 Pedestrians and vehicles shall share the same traffic surfaces except as provided for above.

4.1.7 Road areas shall be illuminated as per section SP-4 Site Lighting.

4.2 Perimeter Patrol Road

4.2.1 The perimeter patrol road shall encircle the complete perimeter at a distance of 8 m (minimum) to 20 m (maximum) from the face of the Outer Perimeter Fence to the centre line of the road.

4.2.2 The paved width of the patrol road shall be 4.8 m, with a prepared shoulder of 1 m on each side.

4.2.3 The patrol road surface elevation shall not be lower than the ground elevation between the perimeter security fences.

4.2.4 The area between the patrol road and the perimeter fence shall be clear of all obstructions, except for guard towers where applicable.

4.2.5 The roadway shall be generally straight; curves shall be mild and sufficiently banked to permit moderately high speeds. Optimal response time for a patrol vehicle to travel one half of the perimeter circumference is 30 seconds; response time should not exceed a maximum of 45 seconds.

4.2.6 The patrol road shall have turn-arounds on each side of the institution as well as at each corner of the perimeter fence. Generally, turn-arounds are provided at approximately 150-m intervals. See Plates SP–2–4, SP–2–5 and SP–5–1.

4.2.7 All turn-arounds shall be paved and sized to allow for a vehicle to turn a full circle; vehicle turning radius shall be assumed to be 7.5 m.

4.2.8 Drainage for the patrol road shall consist of flanking shallow and broad swales to permit vehicle access onto the terrain on either side of the road. Maximum slope for the swale shall be 25% (1:4), to a maximum depth of 600 mm (Plate SP-5-2). The minimum grade cross-slope of the paved surface shall be 2% [11]. See Plate SP-1-2 for a perimeter fences and patrol road general layout and SP-1-3 for a cross-section detail of the road.

4.2.9 Culverts over 350 mm in diameter shall be provided with grilles to prevent their use as hiding places by inmates. Clear grille openings in any one direction shall not exceed 125 mm by 610 mm in the other direction (see details in M-4: 8.2).

4.2.10 Illumination of the patrol road shall be satisfied by perimeter fence lighting as per Section SP-4 Site Lighting.

4.3 Pedestrian Walkways

4.3.1 Walkways shall be asphalt or concrete. Small pavers or thin slabs which can be lifted or broken shall not be used.

4.3.2 Walkway designs shall allow for movement of handicapped persons and of snow removal equipment, and for predicted traffic volume.

4.4 Parking (Other than for CSC Vehicles)

4.4.1 Inmate visitor parking and staff parking shall be separately demarcated. Inmate visitor parking stalls shall be provided at a ratio of 50% of the maximum number of inmates allowed in the visits area at one time (visit capacity); such visit capacity shall be identified on a project specific basis.

4.4.2 The number of staff parking stalls shall be provided at the rate of 1.2 multiplied by the peak weekday shift; this staff complement shall be identified on a project specific basis. The staff parking lot shall also accommodate the cars of official visitors.

4.4.3 Parking areas shall be asphalt paved unless local conditions dictate otherwise.

4.4.4 Curbs shall not be used, although pre-cast wheel stops are permitted.

4.4.5 Landscape islands and trees are permitted but dense planting shall be avoided.

4.4.6 Parking stall dimensions (including those for handicapped persons) and drainage provisions shall conform to local municipal standards.

4.4.7 Parking areas shall be illuminated as per section SP-4 Site Lighting.

4.4.8 See 4.6 for parking electrical outlet.

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11 American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets, 5th Edition, 2004 – AASHTO GD-2 A Policy on Geometric Design of Rural Highways, 1965 – Transport Association of Canada also refers to this document

4.5 Parking for CSC Vehicles

4.5.1 A CSC vehicle fenced parking compound shall be provided; the size shall be defined on a project specific basis.

4.5.2 The parking compound shall be located in relative proximity to the Principal Entrance and shall be in proximity to the perimeter patrol road for ease of periodic surveillance.

4.5.3 The parking compound shall house fuel dispensing pumps.

4.5.4 Fuel storage shall be provided in registered tanks in accordance to the Storage Tank Systems for Petroleum Products & Allied Petroleum Products Regulations[12]. The fuel storage tanks (preferably aboveground) will be located adjacent to the fuel pumps and the distribution lines shall also be aboveground, where feasible. The filling process will be done in the designated fuel product transfer area. Capacities accounting for demand and delivery mode shall be defined on a project specific basis. Parking stall dimensions for various types of vehicles and the drainage and fuelling island shall conform to local municipal standards and applicable authorities.

4.5.5 The parking compound shall be illuminated as per section SP-4 Site Lighting.

4.5.6 See 4.6 for parking electrical outlet.

4.6 Electrical Outlets for Engine Blocks

Parking facilities, under which CSC is the custodian organization, are often located in isolated geographic areas with sustained low temperatures, frequently -20°C or below. In such situation, decision to determine whether electrical outlets for engine block are required is based on the following:

4.6.1 CSC Vehicles

CSC institutions have specific nature, situation and role that differ than any other government institutions. The CSC institutions intent is to have a ready to run CSC vehicles to maintain everyday operations without any obstacles specifically during very low winter temperatures. As a result, we consider the electrical outlets for block heaters are mandatory.

4.6.2 Staff Vehicles

A survey of other Government buildings, local area business, private employers and other facilities in the area of the institution has to be conducted and documented. If this survey shows that the majority of the local parking is being provided with electrical outlets, then parking spaces for staff are equipped with electrical outlets for block heaters.

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12 Tank Systems for Petroleum Products & Allied Petroleum Products Regulations (SOR/2008-197). Regulation under the Department of Justice Canada. http://laws.justice.gc.ca/eng/SOR-2008-197/index.html

4.6.3 Other Vehicles

No electrical outlets for block heater are provided to visitor parking, unattended technical facilities and facilities that are visited only on a periodic basis for maintenance and/or service purposes.

4.6.4 Parking Electrical Outlets General Requirements

For parking spaces provided for CSC vehicles and staff which are used according to a predictable schedule (day shift, night shift), electrical outlets may be controlled by timer or by an intelligent parking lot controller.

Electrical outlets design and installations shall be in accordance with the Canadian Electrical Code and any local or municipal by-law.

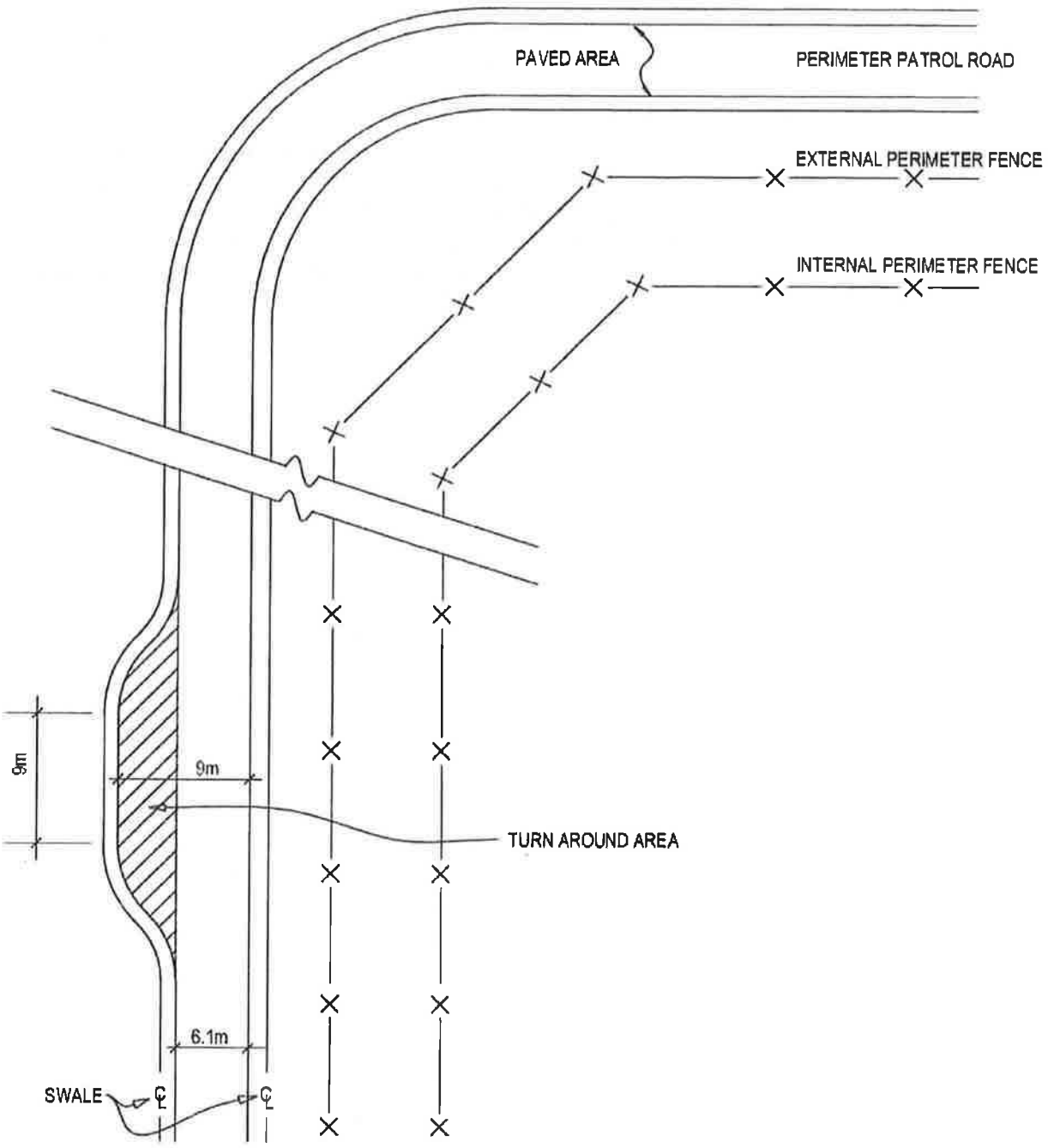


PLATE SP–5–1 – OPTIONS FOR TURN-AROUND

SP-6 SITE – TEMPORARY CONSTRUCTION & TEMPORARY SECURED CONSTRUCTION FENCES

1. SCOPE

This section provides performance criteria and conforming specifications for all temporary construction fences associated with Minimum Institutions. This section also provides performance criteria and conforming specifications for two distinct options for Medium and Maximum Institutions. These options are:

- The **TEMPORARY CONSTRUCTION FENCE** having all its faces located inside the perimeter fences and out of the Buffer Zone (definition in SP-1: 6.1);
- The **TEMPORARY SECURED CONSTRUCTION FENCE** has portions that intersect the Inner Perimeter Fence and has a separate gated entrance/exit through the perimeter other than the Institution's sallyport within the associated construction compound. This type of fence is only for Medium and Maximum Institutions.

As there is a significant cost difference between these distinct options, the selection of one situation over the other is driven by a cost/benefit analysis depending on the project. For example, a separate gated entrance/exit with the Temporary Secured Construction Fence option can save a lot of time for the daily operation of the construction site, especially when a lot of circulation is anticipated, but is by far more expensive than the Temporary Construction Fence option using the Institution's sallyport.

2. RELATED SECTIONS

2.1 Technical Criteria Document sections:

SP-1 - Site Development
SP-2 - Fences
SP-3 - Gates/Sallyports
SP-4 - Site Lighting
SP-5 - Traffic Circulation and Parking

2.2 Other CSC document

Statement of Technical Requirements – Temporary Construction Fences at Medium and Maximum Security Institutions, Correctional Service Canada, Technical Services Branch – Electronic Systems, Issue 3, April 8, 2011.

2.3 National Master Specification section:

01 35 13 – Security Requirements (prior to 2004: 01003 – Security Requirements)
01 56 26 – Temporary Fencing
01 56 36 – Temporary Security Enclosures

3. PERFORMANCE CRITERIA

3.1 Temporary Construction Fence for Minimum Institution

The fence for minimum institution is to act as a restricted casual access. The height of the fence must be 1200 mm high. The fence must be stable and self supporting. No other restrictions are imposed. The temporary construction fence shall be removed from the institution after construction is completed.

3.2 Temporary Construction Fence for Medium & Maximum Institutions

The temporary construction fence is used to enclose and delineate a construction zone within the institution. This fence must not come in contact with the perimeter fences. The fence shall not encroach into the 12-m restricted area inside the perimeter fence

unless approved by Facilities Branch and Security. The temporary construction fence shall be removed from the institution after construction is completed.

3.3 Temporary Secured Fence

3.3.1 Temporary Security Fence encloses and isolates a construction zone within the institution. The fence is a single fence forming a polygon, preferably in the shape of a rectangle. The face of the polygon having the temporary opening uses the Inner Perimeter Fence as a construction zone delimiter. Therefore it intersects the Inner Perimeter Fence at two points. The Temporary Security Construction Fence is a single fence of the same design as an Inner Perimeter Fence (see Plate SP-6-6) and adheres to the "Chapter SP-2 - Fences, Performance Criteria 4.1". However, anti-tunnelling measures are not required.

3.3.2 A Fence Detection System (FDS) is required and connected to the Main Communication Control Post (MCCP).

3.3.3 Cameras are required to monitor the fence line and connected to the MCCP.

3.3.4 A Temporary Vehicular Entrance is similar to a sallyport and comprises three (3) gates, namely (see Plate Sp-6-7, Detail 1):

a) Gate 1: Temporary gate in the Outer Perimeter Fence

b) Gate 2: Temporary gate in the Inner Perimeter Fence

c) Gate 3: Temporary gate in the Temporary Fence forming the Temporary Vehicular Entrance to the construction compound

At any time, at least two gates of the Temporary Vehicular Entrance (Construction Sallyport) are secured, with the keys under the control of the Corps of Commissionaires. The gate are operated one at the time or interlocked. The Commissionaires will provide access to and from the construction area according to the established procedures and only to authorized construction and consultant staff.

3.3.5 The Temporary Security Construction Fence must be cleared of any building by at least 12 m. When the temporary internal construction security fence/line must pass over and along buildings, or closer than 12 m of a building, a security detection system similar to the Senstar "Repel System ®" is required and must connect to the MCCP. Cameras are required to monitor the roof security detection line and must connect to the MCCP. No fence or concertina is required if the parapet of the building is 3600 mm or higher.

3.3.6 The Temporary Security Construction Fences shall be removed from the institution after the construction is completed. If the fence is not removed the FDS, cameras and concertinas must be removed.

4 CONFORMING SPECIFICATIONS

4.1 Temporary Construction Fences for Minimum Institutions

Other than the height requirement of 1200 mm (4') minimum, the fence can be any regular temporary fence for construction site. Rental construction fence or construction fence already own by the contractor can be used provided that they meet the 1200 mm (4') minimum requirement.

4.2 Temporary Construction Fences for Medium & Maximum Institutions

The fence for medium and maximum institutions is to restrict casual access and impede deliberate access to the construction site. The fence must be self supporting.

4.2.1 Site preparation

4.2.1.1 The fence will be in straight lines from corner post to corner post to allow adequate viewing by security staff.

4.2.1.2 Special attention must be paid to sloped sites to ensure gaps do not develop between the existing grade and the bottom of the fence. This "tight-fit" configuration under the fence has to be maintained throughout all the construction duration.

4.2.1.3 Anti-tunnelling measures are not required.

4.2.2 Fence dimension

The height of the fence should be a minimum of 2275 mm high (7'-6") with a minimum panel width of 1200 mm (4') to a maximum of 3000 mm (10'). The gap between the bottom of the fence and the existing grade will not exceed 125 mm. The mounting plate should be fastened to the ground to deter causal lifting and movement. Joints between the fence panels should not exceed 125 mm and should be clamped at every joint top and bottom. The fence should be supported by a buttress 90° to the main fence every 9.0 m (30'). The buttress shall consist of a 1200 mm (4') fence panel, two fence clamps, one mounting base plate and two retaining spikes.

4.2.3 Security panel specifications

4.2.3.1 Welded wire mesh wire which shall conform to the following specifications (see plate SP-6-3):

a) Wire size: Minimum - 4.2 mm (6 gauge).
b) Opening size: Maximum - width 50 mm and height 200 mm.
c) Wire to be spot welded together at all wire joints.
d) Wire to be spot welded to metal vertical and horizontal supports at every wire joint.
e) Wire to be fabricated so that the vertical wire is spiked on the top and bottom (extend beyond the horizontal bars), also referred as "spiked security fence". Other "no climb" measure may be acceptable.
f) Wire Breaking strength to be at least 10,000 N.
g) The wire is preferably galvanized.

4.2.3.2 Horizontal and vertical steel tube supports which shall conform to the following specifications (See plate SP-6-3):

a) Supports (horizontal/vertical): Minimum - 1.3 mm (16 gauge), 32 mm (1.25") Square Steel tube.
b) All joints shall be welded.
c) There will be a minimum of 2 horizontal and 2 vertical supports per panel.
d) The wire is preferably galvanized.

4.2.4 Mounting base specifications (see plate SP-6-5)

4.2.4.1 The external dimensions of the steel plate shall be a minimum 10 mm (3/8") thick, 76 mm wide and 813 mm long.

4.2.4.2 Two 300 mm x 25 mm tubular steel posts are welded in parallel relation to each other approximately 200 mm from one end of the steel plate and 25 mm from the edge. This provides securing two panels on one

base. During installation, the vertical support of the panel slides over the steel post on the base.

4.2.4.3 There shall be two 13 mm diameter holes, centered on the width approximately 25 mm from each end of the base plate. These holes must be dimensioned with enough tolerance to receive 12.5 mm diameter restraining spike.

4.2.4.4 The extension of the mounting base must project on the construction side of the fence.

4.2.4.5 The wire is preferably galvanized.

4.2.4.6 Concrete mounting bases are not acceptable.

4.2.5 Spikes specifications

4.2.5.1 The spike shall be a 12.5 mm diameter steel spike with a 50 mm head.

4.2.5.2 Spike length has to be determined by an engineer to prevent fence toppling and based on soil/rock condition.

4.2.5.3 The spike is preferably galvanized.

4.2.6 Fence clamps specifications (See plate SP-6-4)

4.2.6.1 The clamp consists of two plates with a carriage bolt and nut to tighten the plate together.

4.2.6.2 The steel clamp plate shall be 12.5 mm thick, 51 mm wide and 152 mm long.

4.2.6.3 There shall be one 13 mm diameter hole centered on each plate. This hole must be dimensioned with enough tolerance to receive a 12.5 mm diameter carriage bolt.

4.2.6.4 The clamp plate shall be bent to a 15° angle, 32 mm from each end of the plate.

4.2.6.5 The clamp is preferably galvanized.

4.2.7 Carriage clamp bolt specifications (See plate SP-6-4)

4.2.7.1 The carriage clamp bolt shall be 12.5 mm diameter and 75 mm long. The nut shall be a 12.5 mm carriage bolt nut.

4.2.7.2 The carriage clamp bolt are welded to one of the clamp plates so that the bolt can protrude through the other clamping plate and be tighten by the carriage nut. The Carriage nut must be on the construction side of the fence.

4.2.7.3 The bolt and nut are preferably galvanized.

4.2.8 Gates or doors specifications

4.2.8.1 The gates / doors consist of the typical fence panels as described above. The maximum width is 3000 mm.

4.2.8.2 The gates/doors are of the swing type. Sliding gates are not required.

4.2.8.3 The gates/doors must permit locking with chain and high security padlock. The padlocks are provided by the Institution. The gap between the fence and the gate/door or a double gate/door must not exceed 125 mm on both sides (lock side or swing side).

4.3 Temporary Secured Construction Fences

4.3.1 The Temporary Secured Construction Fences are a single row of fences enclosing and delineating a construction zone within the institution that is in contact or abuts the Inner Perimeter Fence will adhere to the specification for an interior fence as in "Chapter SP-2 – Fences, Conforming Specifications 4.1.8 and 4.2."

4.3.2 See plate SP-2-1, SP-2-2 and SP-2-3 in "Chapter SP-2- Fences".

4.3.3 For the section of the fence intersecting the Inner Perimeter Fence, double concertina fence section is not necessary as inmates are only present on the Institution Side of the fence. However the FDS of the adjacent panels to the intersection must be over wrapped into the first 2.5 m of the intersecting section of the Temporary Secured Fence.

4.3.4 The three temporary construction gates must conform to "Chapter SP-3 - Gates and Sallyport, 5. – Fence Gates, 5.2 Vehicle Swing gates". Gate 2 (the gate on the Inner Perimeter Fence) requires FDS that can be masked during construction hours and unmasked for all other times. The gate FDS must connect to the MCCP.

4.3.5 Motion Detection System (MDS) cable is present in the No Man Zone. This cable has to be protected from heavy vehicular during construction.

4.3.5.1 A cost effective approach is to install an asphalt pad, at least 15 cm (6") thick, over the MDS cables at the vehicle entrance (see Plate SP-6-7).

4.3.5.2 This material can be removed following construction. An alternative approach is to use a concrete pad as a "temporary measure". This should be removed when the construction is complete. The concrete pad should be poured on top of 19 mm (¾") plywood; is 15 mm (6") to 20 mm (8") thick, and should use fibreglass strand reinforcement, steel rebar affecting the buried cable system.

4.3.5.3 If a permanent driveway is required, then a concrete or paved driveway will have to be designed and installed.

4.3.5.4 It is also important to aggressively limit the use of salt during winter months. Excess salt will drain to the sides and seep into the surrounding soil creating a potential dead zone in the MDS cables RF field. Too much salt can take months to clean out with heavy rains in the springtime.

4.3.6 A temporary microwave system covers the No Man Zone adjacent to the intersecting section of the Temporary Secured Fence (Plate SP-6-6).

4.3.7 If temporary fences with temporary gates are installed between the Perimeter Fences at the No Man Zone, they must be designed to not interfere with both the MDS and temporary microwave systems.

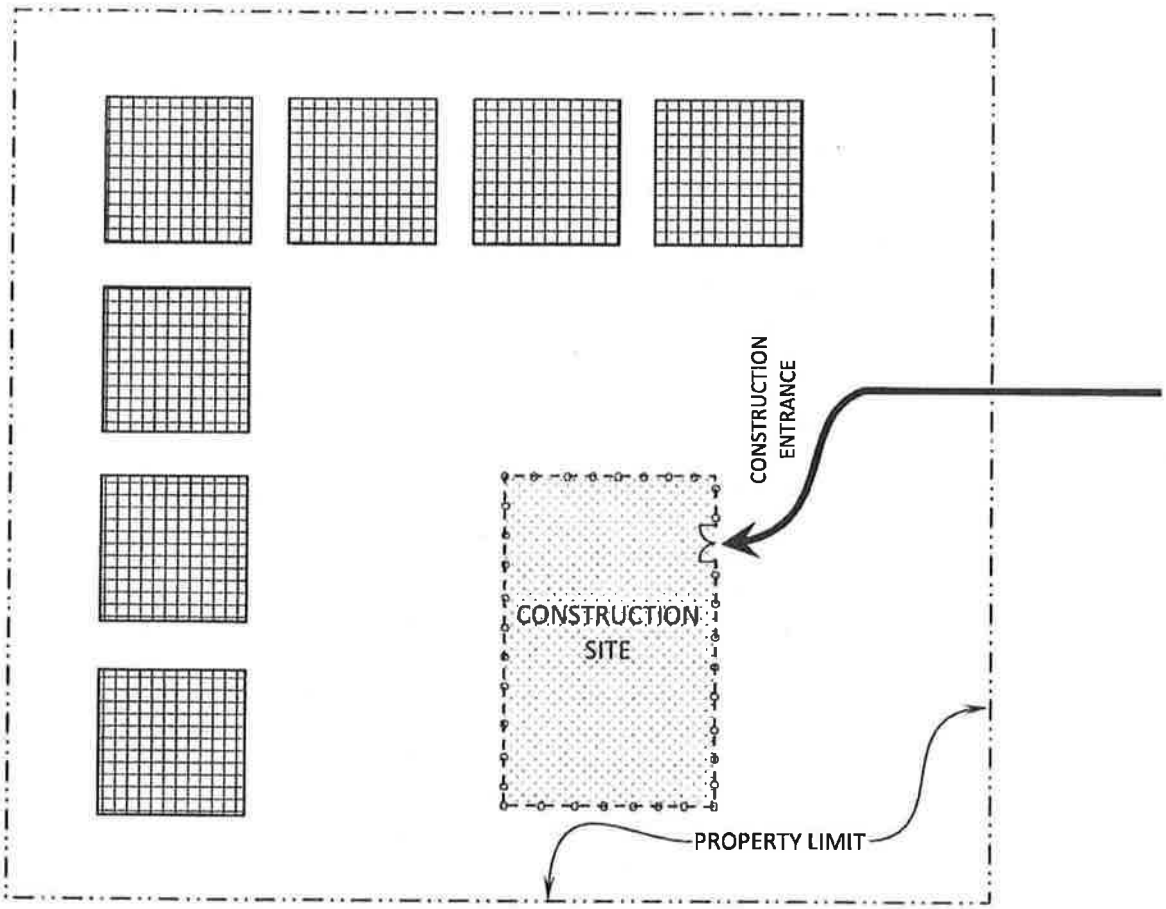


PLATE SP–6–1 – TEMPORARY CONSTRUCTION FENCES FOR MINIMUM INSTITUTION

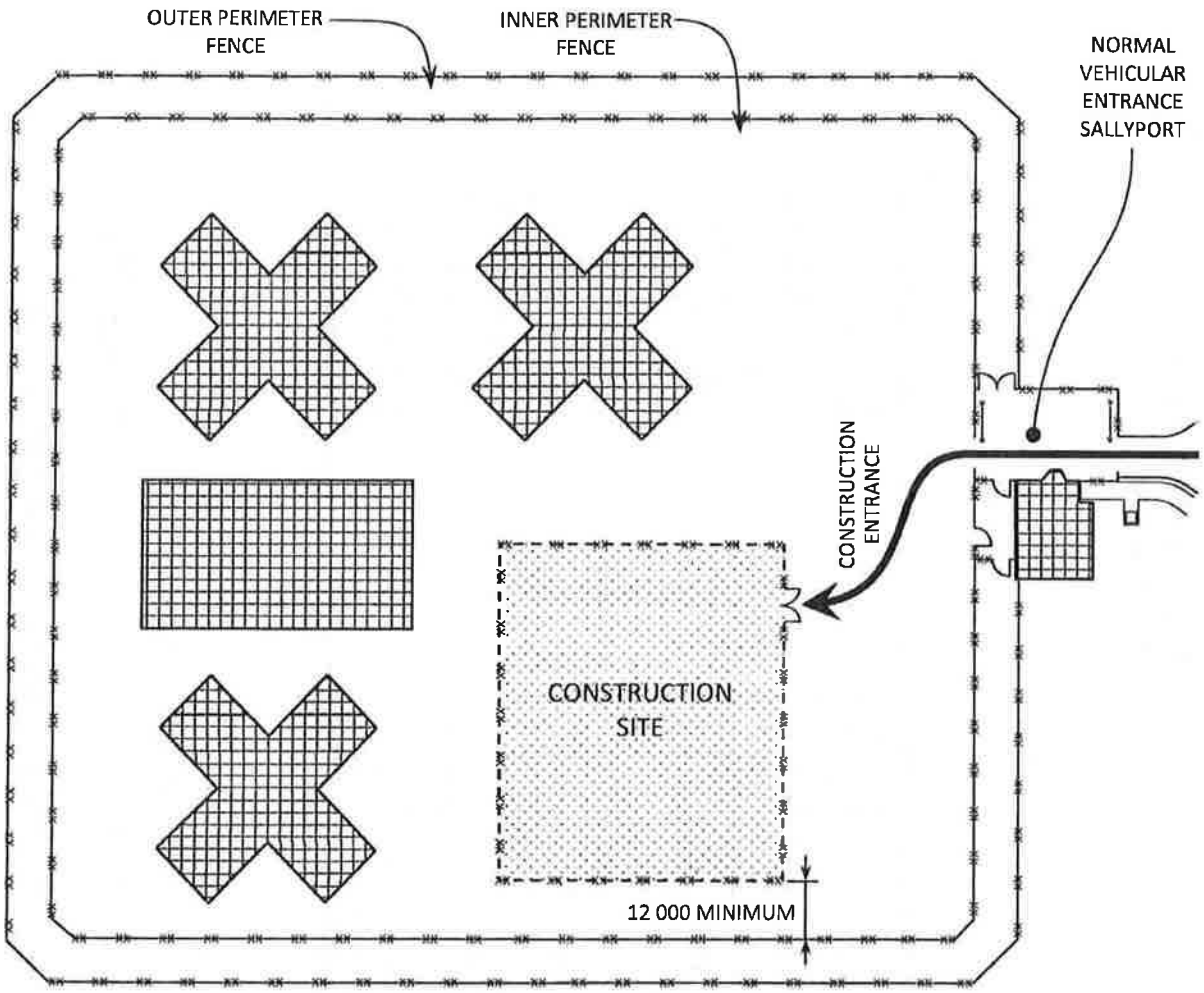
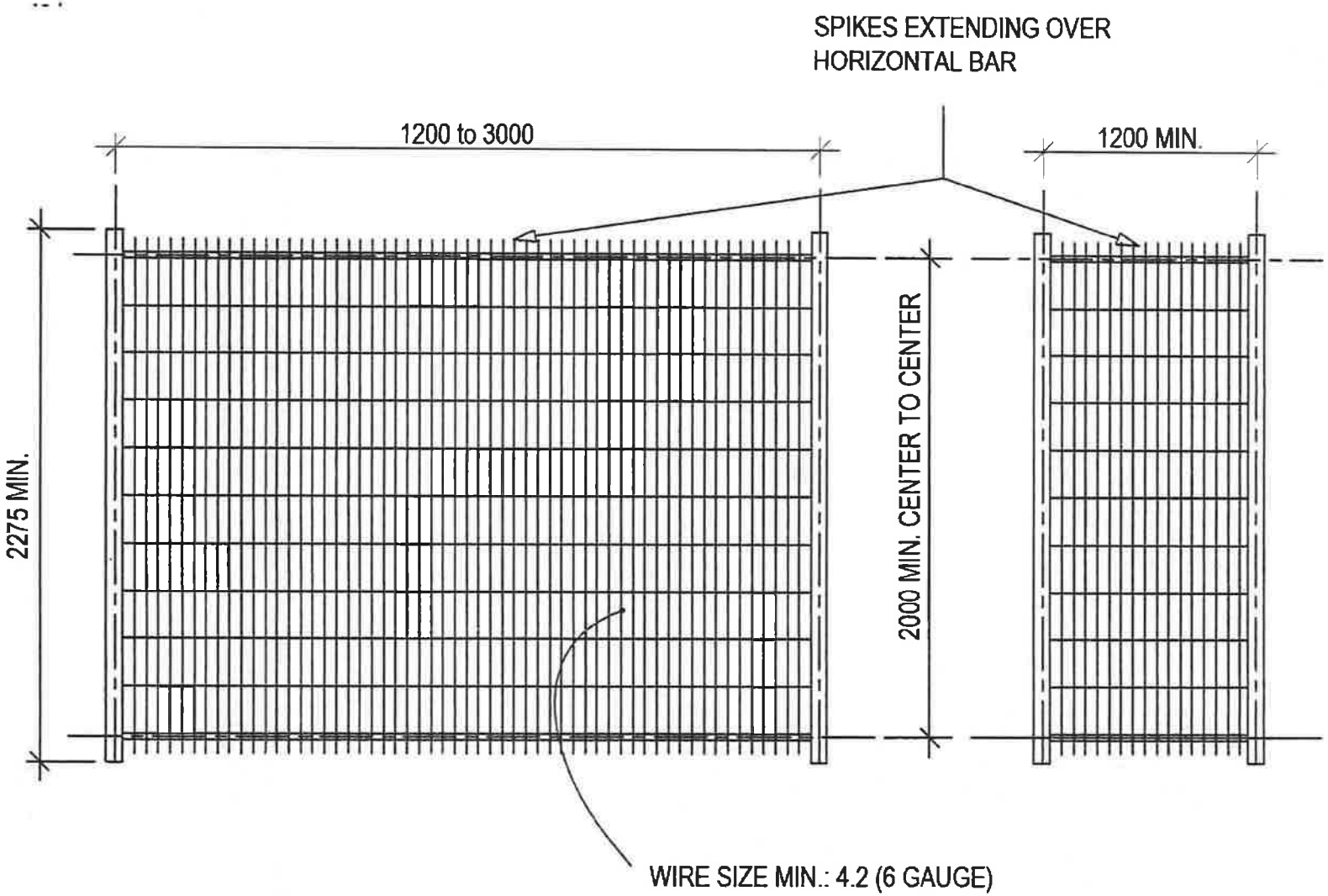
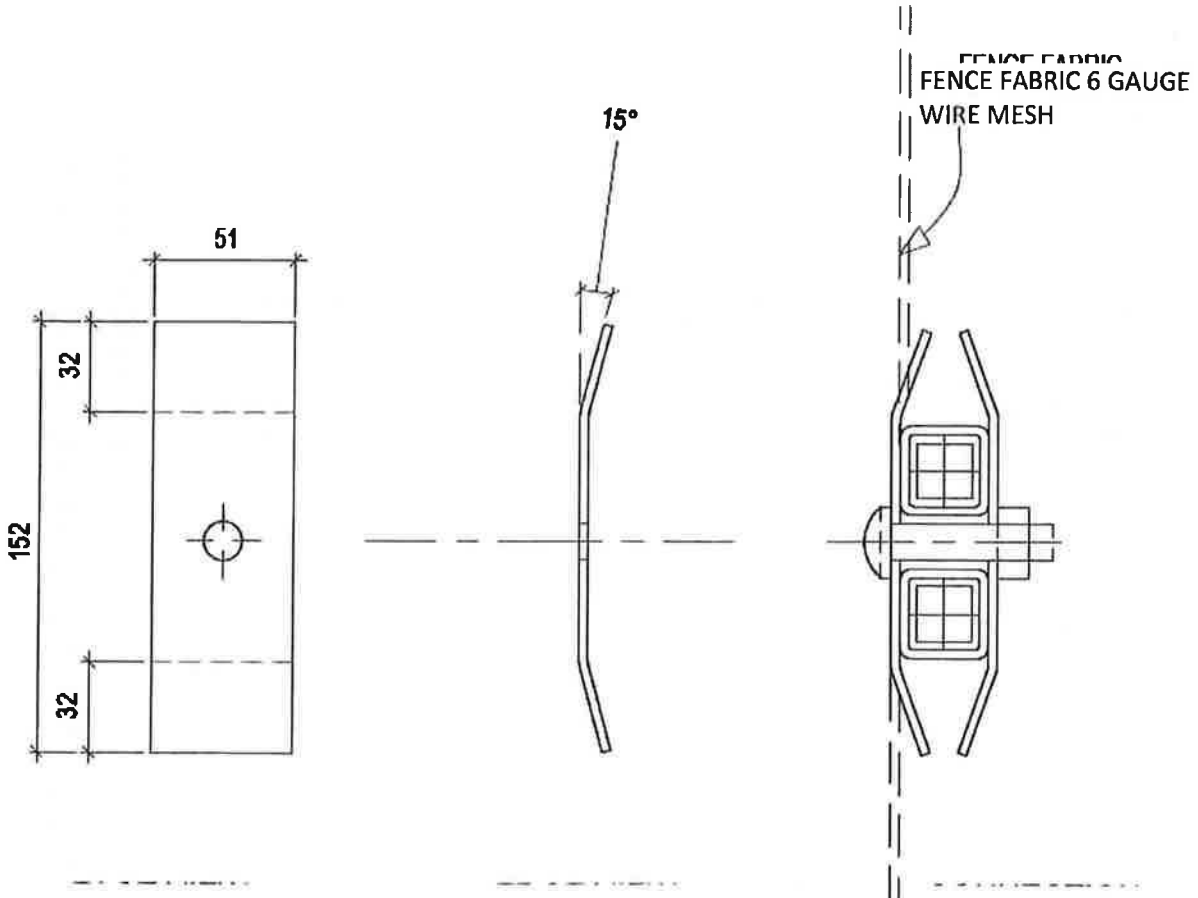


PLATE SP–6–2 – TEMPORARY CONSTRUCTION FENCES FOR MEDIUM AND MAXIMUM INSTITUTIONS



TEMPORARY SECURITY FENCE PANEL **BRACE PANEL**

SP–6–3 – TEMPORARY CONSTRUCTION FENCE – TYPICAL PANEL



FACE VIEW

Pl. 50 x 150 x 3.175
C/W 15mm CENTRE HOLE
BAR TO BE BENT TO A
15° ANGLE 32mm FROM
EACH END
CARRIAGE BOLT

EDGE VIEW

SPIKED TOP AND BOTTOM
NO MORE THAN 125mm (5") CLEARANCE
TWO (2) CLAMPS PER PANEL JOINT
STAND METAL: EACH STAND MUST HAVE
TWO SPIKES ON INSIDE OF FENCE
METAL STAND EXTENSION ON ONE SIDE
ONLY
HEIGHT MINIMUM 2236 (7'-6")
PANEL WIDTH
LONG FENCE PINS MUST BE SUPPORTED
BY BUTTRESS EVERY 12 192 (40')

FENCE FABRIC 6 GAUGE WIRE MESH

CONNECTION – PLAN VIEW

(SHOWN WITH 12.5mm
(1/2") CARRIAGE BOLT)

PLATE SP–6–4 – TEMPORARY FENCE DETAILS – PLANEL CLAMP CONNECTION

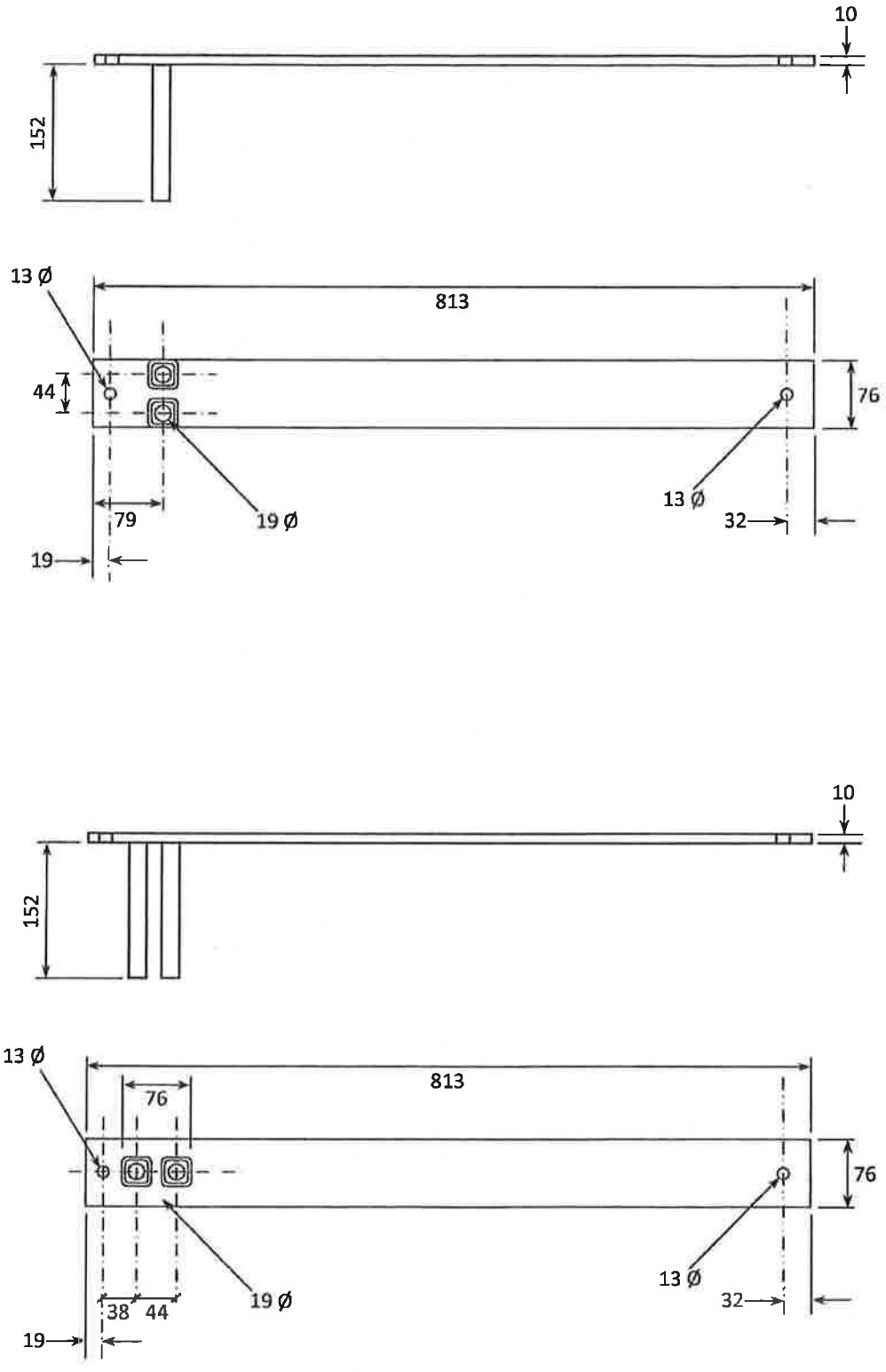
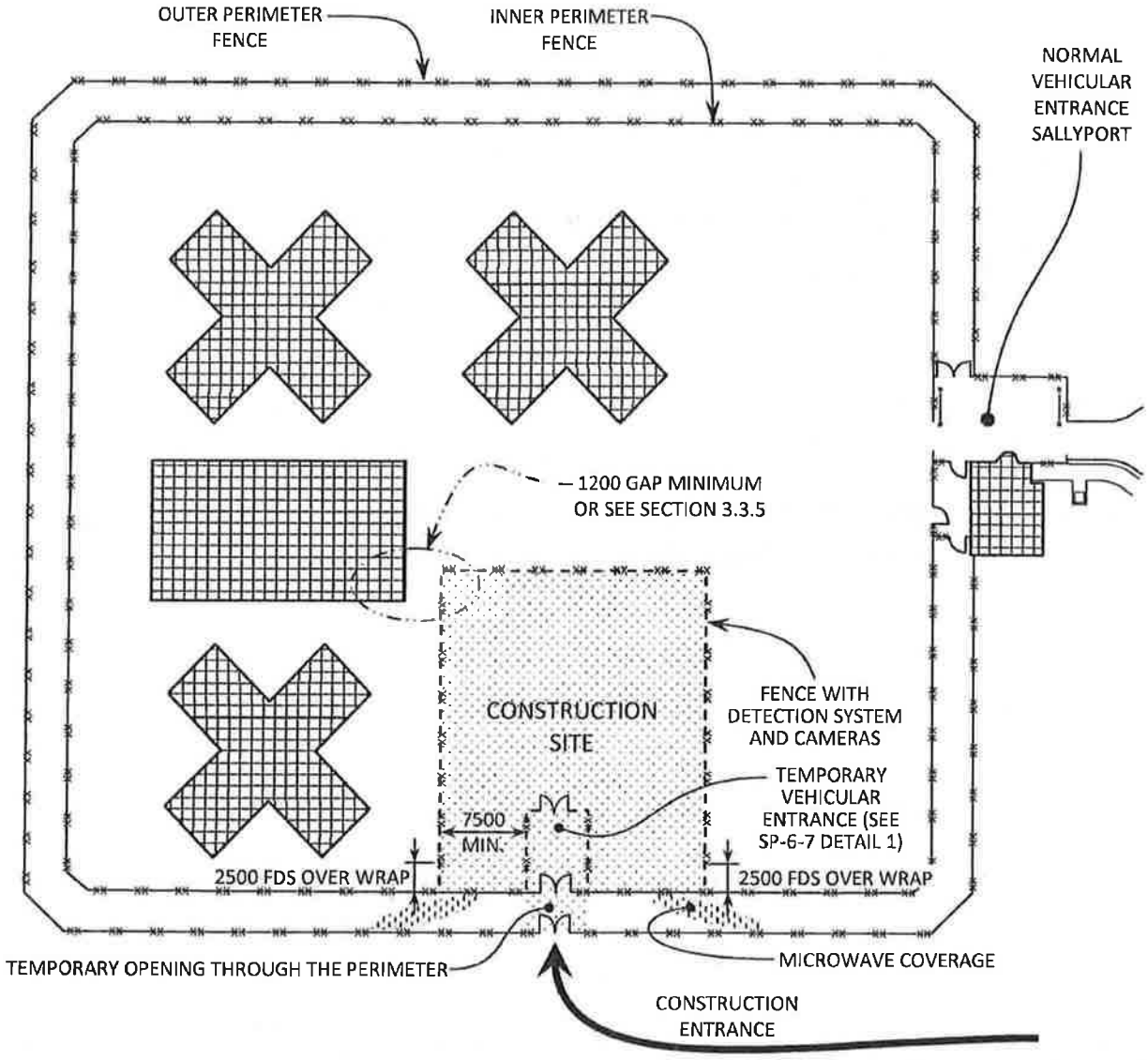


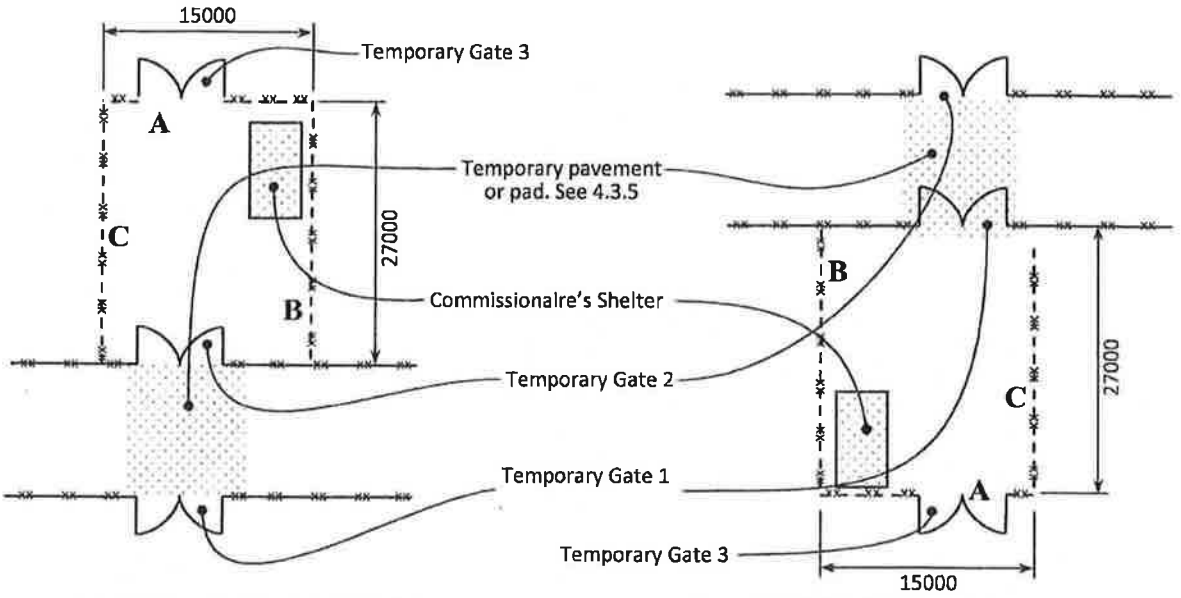
PLATE SP–6–5 – TEMPORARY CONSTRUCTION FENCE – BASE PLATE DETAILS

WITH IN LINE DOWELS

WITH DOWELS AT RIGHT ANGLE

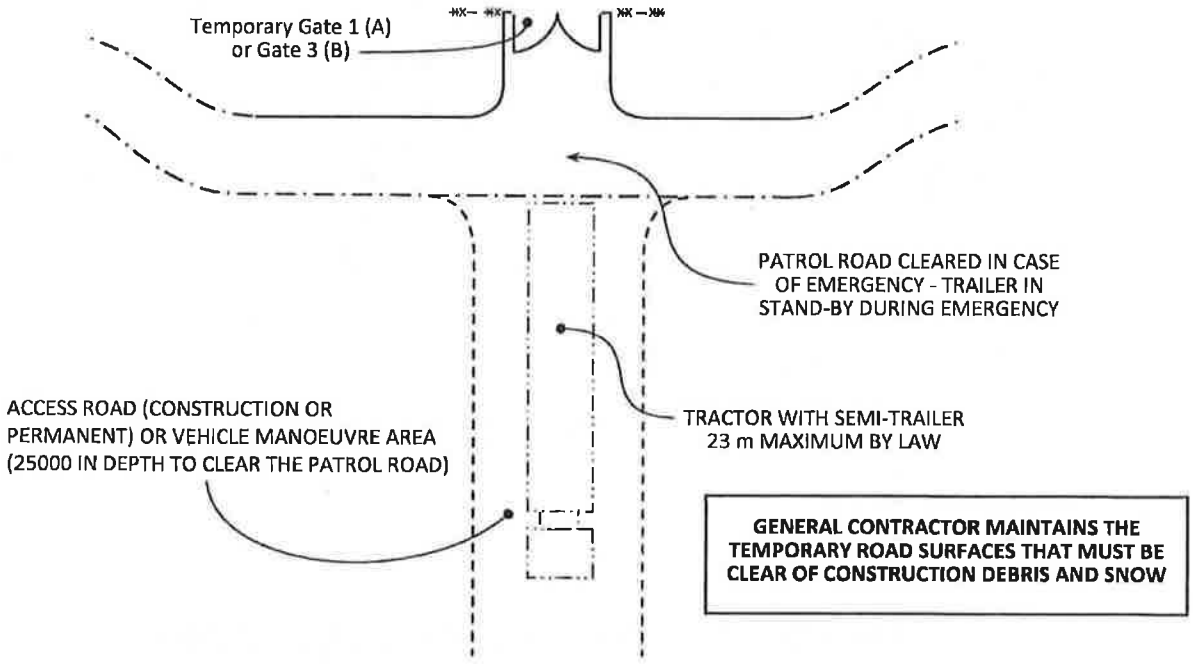


SP–6–6 – TEMPORARY SECURED CONSTRUCTION FENCES



A – INSIDE THE INSTITUTION **B – OUTSIDE THE INSTITUTION**

DETAIL 1 – TEMPORARY VEHICULAR ENTRANCE



DETAIL 2 – TEMPORARY VEHICULAR ENTRANCE

SP–6–7 – TEMPORARY SECURED CONSTRUCTION FENCES – ENTRANCE DETAILS

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SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations

GO AND GI PROJECTS

SECTION SU – SITE UTILITIES

Canada

TABLE OF CONTENTS

SU-4 SITE UTILITIES – POWER SUPPLY AND ELECTRICAL POWER DISTRIBUTION

SU-1 SITE UTILITIES – STORM AND SANITARY SEWERS

1. SCOPE

This section sets out technical guidelines and criteria for storm and sanitary sewers serving CSC Institution properties.

2. RELATED SECTIONS

SP–1 – Site Planning and Development
SP–5 – Traffic Circulation & Parking
SU–2 – Wastewater (Sewage) Treatment
SU–3 – Water Utility
M–2 – Plumbing Requirements

3. DESIGN CONSIDERATIONS

3.1 *General*

Design of storm and sanitary sewers shall be based on good engineering practice and conform with all applicable codes, regulations and standards in the specific locality of the work. In addition, the following requirements of CSC shall be given special consideration:

3.1.1 Imminent and future development plans
3.1.2 Project specific security requirements
3.1.3 Operation and maintenance aspects as related to the special requirements of a C.S.C. institution.
Institution sewerage systems are often used by inmates to dispose of contraband, clothing and other bulky items which may block sewer pipes, manholes, pumps and treatment equipment. Screening or comminution equipment must be installed at suitable locations in the collection system. Such equipment shall be power operated, automated (requiring minimum operator manipulation).
3.1.4 Separate sanitary and storm sewer systems will be used and, insofar as is feasible, sewers will be at such a depth as to admit contributing flows by gravity.
3.1.5 Pumping Stations
3.1.5.1 Consider the implications of power failure and of exceeding the pumping capacity.
3.1.5.2 Provide high and low sewage level alarms properly identified to the technical services work station and if this station is not manned on a 24 hour day basis, to the Main Communication Control Post (MCCP).

3.2 ***Estimation of Flow Quantities***

Determine the quantity of wastewater based on the following as appropriate:

3.2.1 Storm - select a storm frequency consistent with the actual or anticipated land use, suggested:
3.2.1.1 50 year maximum for main conduits and high value areas
3.2.1.2 10 year for upstream connecting conduits.
3.2.2 Sanitary

3.2.2.1 The average daily domestic water consumption shall be based on the monitoring data collected by each institution. Where data is not available, the consumption shall be based on 550 ℓ/day/user . The total users shall be the total inmate population plus one third of the total institution staff. Water requirements for food preparation and dishwashing are included in this allowance.

3.2.2.2 Water requirements for laundry, industrial and agribusiness shall be based on accepted practice, historical data and manufacturers' recommendations. Estimate the minimum and maximum flows where they cannot be measured using the following relationships:

- Maximum daily: Average daily x 2.50
- Minimum daily: Average daily x 0.75
- Peak: Mean rate during the maximum 15 minutes for any 12 month period. For CSC Institutions take at 4 times the average daily.

3.2.2.3 The population and industry estimates should be those anticipated during the design period, which should not be less than 25 years for sewer mains.

3.2.2.4 The above consumption may be modified in accordance with reliable historical data from existing similar institutions.

4. SECURITY CONSIDERATIONS

4.1 Surface Drainage

4.1.1 Inside Perimeter Fence

Minimize the use of open channels in areas within the perimeter. In general, surface drainage will be by buried storm sewers. The use of culverts must be submitted to C.S.C. for approval.

4.1.2 Outside Perimeter Fence

For the area 100 m outside the perimeter fence, open channels, wide and shallow rather than narrow and deep shall be used whenever practical. Where culverts are required they shall not permit the entry of an inmate as a possible hiding place. This may be achieved by the use of multiple small culverts rather than a single large size or the installation of metal bars at outlet.

4.2 Manhole Covers

In S-3 to S-7 institutions all manholes and catchbasins within the perimeter fence shall be secured with special fastenings to prevent unauthorized entry. Specify standard covers and frames to be modified as follows: (See Figure SU-1-1)

4.2.1 Covers: Drill three equidistant 20 mm holes near the perimeter to receive 16 mm stainless steel hexagon head bolts. Countersink for washers and bolt heads to ensure a flush installation.

4.2.2 Frame: Drill and tap frame to receive the bolts from the cover. Specify lugs if necessary for this purpose.

4.3 Perimeter Fence Crossings

4.3.1 To prevent possible escape routes, minimize the number of sewer pipes larger than 350 mm OD within the perimeter fence by locating larger mains outside the fence with branch connector lines from within.

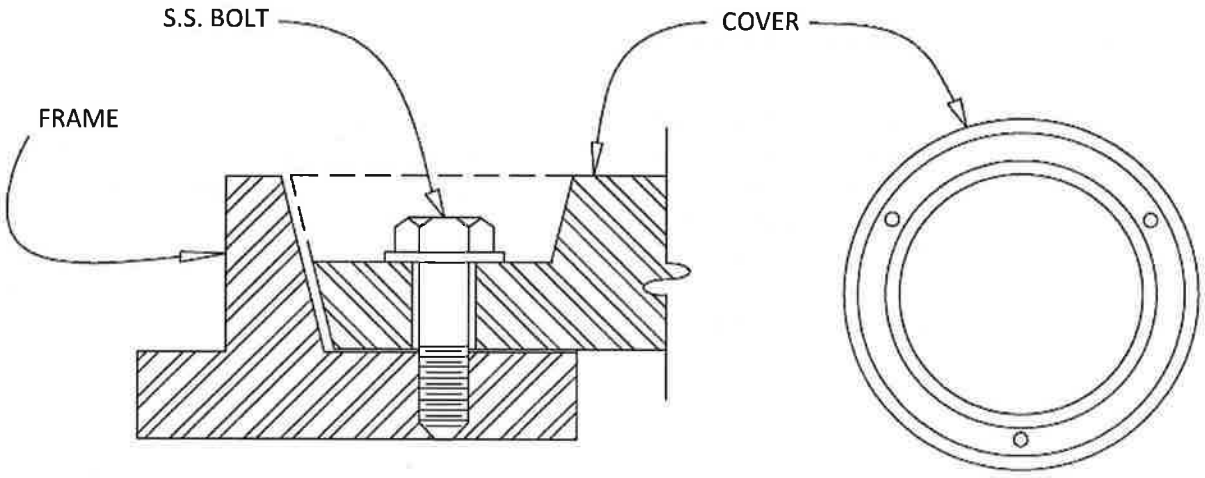
4.3.2 For an S-3 to S-7 institution, if a sewer line larger than 350 mm OD is required to cross the perimeter fences, insure that it cannot be used as an escape route. An acceptable solution is to provide distributing manholes on both sides of the fences and run the required number of 350 mm OD (or smaller) pipes joining the two manholes. Refer to Plates SU-1-2 and SU-1-3 and table 1 for details.

4.4 Perimeter Intrusion Detection System (PIDS)

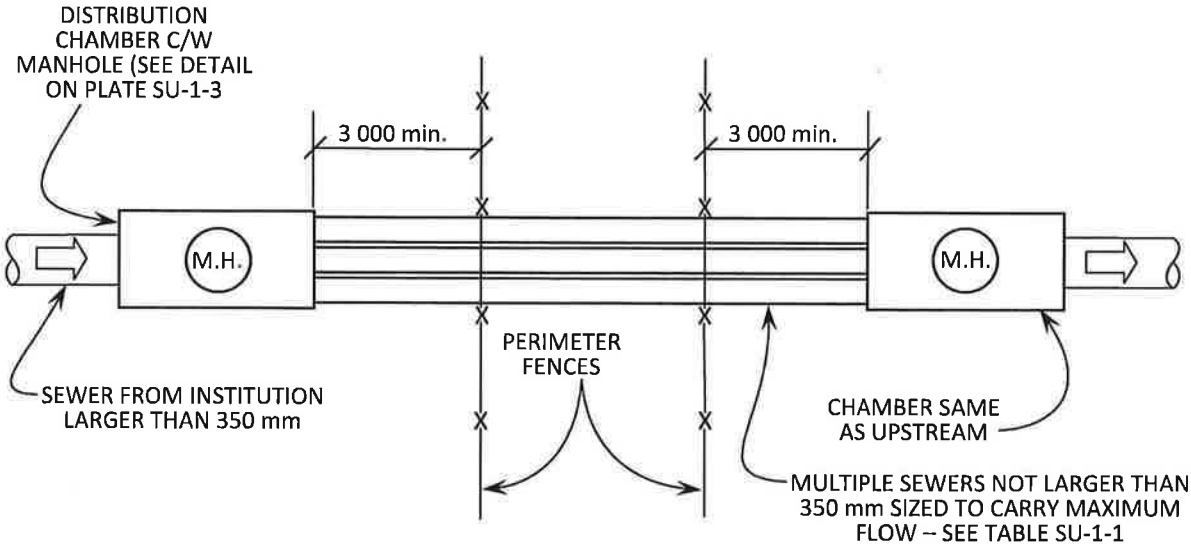
Requirements

4.4.1 Since the PIDS system may be affected by both metal pipes and variable flowing liquids, all pipes crossing the perimeter fence for S-3 through S-7 institutions shall be a minimum of 1.5 m below grade. This requirement need not be followed at the sally port.

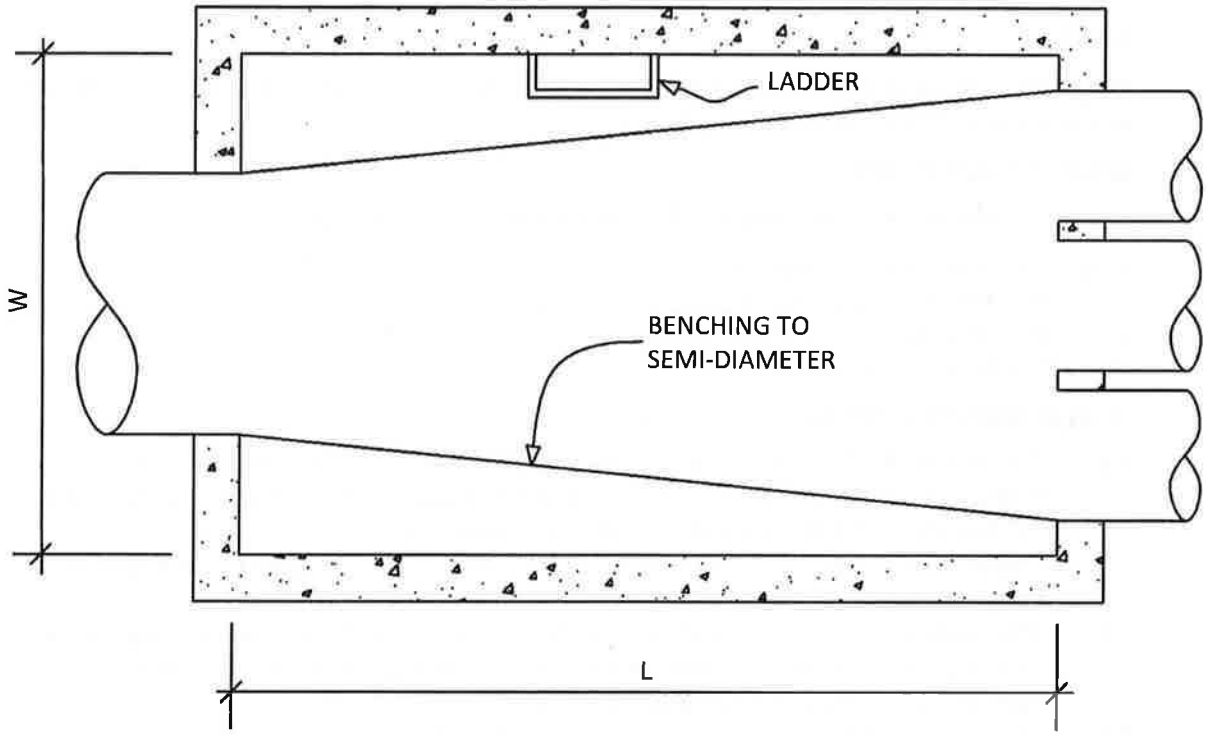
4.4.2 Any liquid flow with changing mass, such as varying flow in partly filled sewer or storm drainage pipes, must also be a minimum of 1.5 m below grade even if the pipes are non metallic.



SU–1–1 – SECURITY MANHOLE COVER



SU–1–2 – LARGE SEWERS CROSSING PERIMETER FENCES – GENERAL LAYOUT PLAN



SU–1–3 – LARGE SEWERS CROSSING PERIMETER FENCES – DISTRIBUTION CHAMBER DETAIL

TABLE SU–1–1 – DISTRIBUTION CHAMBER DIMENSIONS

INLET DIAMETER mm OD	NO. OUTLET PIPES	H mm	W mm			L mm
			1 Tier	2 Tier		
350 to 500	2	30	1 100			2.0 W
600	3	30	1 600			2.0 W
700	4	30	2 000			2.0 W
750	5 (3 + 2)	40		1 600		2.5 W
800	6 (3 + 3)	40		1 600		2.5 W
900	7 (4 + 3)	45		2 000		2.5 W

H = Difference in invert levels between inlet and lowest tier outlet
W = Chamber width internal
L = Chamber length internal

SU-2 SITE UTILITIES – WASTEWATER (SEWAGE) TREATMENT

1. SCOPE

The intent of this section is to set out technical guidelines and criteria for wastewater treatment facilities serving CSC Institution properties.

2. RELATED DOCUMENTS

This section should be read in conjunction with the following as applicable:

SP–1 – Site Planning and Development
SU–1 – Storm and Sanitary Sewers
SU–3 – Water Utility
M–2 – Plumbing Requirements

3. DESIGN CONSIDERATIONS

3.1 This section deals with property sanitary wastewater treatment systems including pre-treatment, (screening, comminution and grit removal), primary treatment, secondary treatment and the disposal of the products of treatment.

3.2 Storm water will not be treated unless there are exceptional environmental requirements.

3.3 All drainage infrastructure and wastewater treatment facilities shall be designed and constructed in accordance with CSC's CD 318-6[1], all applicable Federal, Provincial and local legislation, regulations codes and standards.

3.4 The quantity of wastewater to be treated shall be determined from potable water use data for each institution or from reliable data from existing similar institutions. The design period should not exceed 20 years.

3.5 All treatment plant shall be designed with a level of redundancy in each treatment components to allow for repair and maintenance without requiring bypass or shut down.

3.6 Loadings forecasts wastewater treatment systems may be based on reliable historical data from existing similar institutions or in the absence of such data use the following:

	Allowance per person	
	BOD	SS
Inmates/Patients	0.175 kg/day	0.20 kg/day

3.7 The minimum criteria for wastewater treatment shall meet the requirements as set out in CSC's Management of Wastewater Treatment Systems Guideline CD318-06, the Environment Canada Wastewater Systems Effluent Regulations and local (provincial/ municipal) discharge criteria.

3.8 Sewage systems discharging to on site lagoons shall include screening and will not rely solely on communition.

3.9 High and low level sewage alarms shall be installed and properly transmitted to a station that is manned on 24 hours a day.

[1] CD 318 – Guidelines 318-6 – Management of Wastewater Treatment Systems (2003-06-11)

4. SECURITY

4.1 Treatment plant installations shall be designed so as to prevent unauthorized entry.

4.2 Suitable remote monitoring and warning devices shall be provided at the technical services work station and if this is not manned on a 24 hour basis critical alarms shall be run to the Main Communication Control Post (MCCP).

4.3 Assess the implications of power failure and where warranted connect to emergency standby power facilities. Redundant pump and other critical components shall have control systems that provide for automatic lead lag rotation and engagement in the event of failure of the primary unit.

4.4 It cannot be stressed too strongly that wastewater treatment at CSC Institutions is not the same as wastewater treatment under normal municipal circumstances. Inmate behaviour may lead to deliberate vandalism and misuse of system and must be considered. As such wastewater treatment technology used should be able to effectively deal with significantly higher plastic and fabric loads; shall be industry standard with wide industry usage and local serviceability.

SU-3 SITE UTILITIES – WATER UTILITY

1. PURPOSE

1.1 The intent of this section is to set out technical guidelines and criteria for domestic and fire protection water supplies serving CSC Institution properties.

1.2 This criterion is to be used to supplement Public Works Canada, and Fire Commissioner Canada standards and guidelines, applicable plumbing, building and Fire code requirements. In particular, potable water systems shall be designed and constructed to meet Health Canada's Drinking Water Guidelines and to support the applicable system requirements specified in the most recent version Health Canada's publication *Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction*[1].

1.3 Departures from this Document shall be supported by explanation and data satisfactory to CSC and all authorities having jurisdiction.

1.4 Design of the site fire protection systems are subject to the approval of the Fire Commissioner of Canada (FCC). All codes should be respected, but the Commissioner has the final decision.

2. RELATED DOCUMENTS

2.1 This section should be read in conjunction with the following TCD sections as applicable:
SP–1 – Site Planning and Development
SP–5 – Traffic Circulation and Parking
SU–1 – Storm and Sanitary Sewers
SU–2 – Wastewater Treatment
M–2 – Plumbing
M–3 – Fire Protection

2.2 In addition the following will be observed as applicable:
2.2.1 PWC Design and Construction Branch Standards and Guidelines
2.2.2 Government of Canada Master Specifications
2.2.3 Canadian Guidelines for Drinking Water Quality
2.2.4 Provincial Drinking Water Guidelines
2.2.5 Guidance for Providing safe drinking water in areas of federal jurisdiction
2.2.6 Fire Commissioner Canada Standards[2]
2.2.7 Local applicable codes and requirements

3. SCOPE

The scope of the design work of project water utility systems includes the following:

- Connections to the building systems 2 m outside the building
- Site distribution and metering
- Connections to public utility main(s)
- CSC owned and operated water supply and treatment system
- Domestic and fire protection water storage.

4. INSPECTION

Establish responsibility regarding payments and inspectional requirements to obtain final approvals by the authorities having jurisdiction.

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1 Health Canada – Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction - Version 1 – 2005, ISBN: H128-1/05-440E, Cat. No.: 0-662-41691-0

2 http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/guidance-federal-conseils/index-eng.php
http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/index.shtml

5. EMERGENCY POWER

All water treatment and supply equipment, alarm, controls, and accessories requiring electrical power should be supplied with emergency secondary power supply.

6. BASIC DESIGN REQUIREMENTS

Establish contact with local utility company, municipality environmental protection agency, municipal fire department and fire Commissioner of Canada to obtain the following information:

6.1 Existing water main(s) location, size and elevation

6.2 Utility water residual pressure for the Project flow requirements.

6.3 Allowable, water capacity supplied by the utility company, and security of supply

6.4 Requirements relating to water metering system

6.5 Requirements relating to the division of responsibility with regard to the extent of work to be provided by the Utility and/or User.

6.6 Requirements relating to the type and quality of the materials utilized for the site water systems.

6.7 Requirements relating to the acceptable minimum and maximum sizes of the Project water connection(s) to the utility main(s).

6.8 Requirements relating to the acceptable type and process system of the water treatment and make up facilities, if required.

6.9 Requirements relating to the water disinfection system.

6.10 Location of the existing fire hydrants.

6.11 Thread standards for the site fire hydrant and fire department connections.

7. WATER DISTRIBUTION AND FIRE HYDRANT

7.1 Consider separate domestic and fire protection water distribution systems.

7.2 Site water distribution system should be designed forming sectionalized loops and providing at least two service connections to each major building.

7.3 Water meter assemblies should be located in pits or buildings, accessible to the utility company generally outside the perimeter fence.

7.4 Site distribution loop used for domestic water system only should be of the size required by consumption, but should not be smaller than 100 mm in diameter.

7.5 Site distribution loop used for domestic and fire protection water should be at least 200 mm in diameter. Give justification for any recommendation of main sizes larger than 250 mm.

7.6 Water pressure in the site distribution loop should not be less than 50 PSIG.

7.7 Design and specify adequate number of loop sectionalizing valves, as required by the building and loop layout.

7.8 All bends, fire hydrants and branch 'tees' in the underground distribution lines should be designed with the required trust blocks.

7.9 Valves controlling water supply, including sectional valves, with the exception of those controlling an individual hydrant, should be the "Indication Type Sectional valves should be designed so that the majority of hydrants may remain in service during a water outage caused by a break or maintenance.

7.10 Hydrants shall be equipped with two 65 mm hose outlets and a fire department pumper connection, sized and threaded to fire department requirements.

7.11 Hydrants shall be located such that they are not less than 1.5 m nor more than 3 m from access roads and readily accessible to fire department apparatus.

7.12 Hydrants shall be so located that all parts of the perimeter of the building can be reached by hose streams with not more than 75 m of hose attached to a hydrant.

7.13 Fire department connections shall be located in supervised areas and accessible to fire department apparatus at all times.

7.14 Fire department connections shall be located so that the distance from a fire department connection to a hydrant does not exceed 45 m and is unobstructed.

8. WATER QUANTITIES

8.1 Domestic Water Consumption shall be based on the following:

8.1.1 The average daily domestic water consumption shall be based on existing potable water use data for the institution or existing similar institutions. If no reliable data is available, then an average of 500 litres/day/user shall be applied. The total users shall be the total inmate population plus one third of the total institution staff. Water requirements for food preparation and dishwashing are included in this allowance.

8.1.2 Water requirements for large scale laundry facilities, industrial, irrigation and agribusiness shall be added to the above amount and shall be based on accepted practice, historical data and manufacturers' recommendations.

8.1.3 Estimate the minimum and maximum flows where they cannot be measured using the following relationships:

- Maximum daily: Average daily x 2.50
- Minimum daily: Average daily x 0.75
- Peak: Mean rate during the maximum 15 minutes for any 12 month period. For CSC Institutions take at 4 times the average daily.

8.1.4 The above consumption may be modified in accordance with reliable historical data from existing similar institutions.

8.2 Water required for fire protection shall be as outlined in M-3:6 – SPRINKLER SYSTEM.

9. WATER SUPPLY

To guard against interruption of service the water supply shall meet the following requirements:

9.1 When available the water supply shall consist of two separate connections to different municipal utility mains with adequate quantity to meet fire protection requirements.

9.2 Where only one connection is practical from a municipal supply or if the quantity is not adequate to meet the fire requirements, supplement municipal supply with on site storage tanks or reservoirs and pumping system. See M-3:9 – FIRE PUMPS for fire pump requirements.

9.3 Where no municipal supply is available, provide a private supply and on site storage with pumping systems.

10. WATER TANK

10.1 The capacity of the water storage tank shall meet the requirements of both the domestic water supply and fire protection water unless non potable water supply is used for fire protection.

10.2 Domestic water storage shall be not less than 24 hours reserve of the average calculated water consumption.

10.3 Fire protection water quantity shall be as specified in M-3:6 – SPRINKLER SYSTEM.

10.4 Design system with at least two tanks or compartments and a separate pump well so that one compartment or tank can be cleaned or repaired while the other can continue to provide water service.

10.5 Water storage tanks shall include, as a minimum, flow through operations and consideration will be given to including active mixing technologies.

10.6 Any pumps or fittings in storage tanks, shall be designed and installed such that they may be serviced or replaced without having to drain or enter the tank.

10.7 All potable water storage tanks shall have securely locking access doors or lids. The lock shall be such that tampering will leave an indication.

10.8 Storage tanks located outside shall be located inside a chain link security fence with Bollards on all four corners.

11. PRIVATE WATER SUPPLY

11.1 General

11.1.1 Where a municipal water supply is not available, a private supply must be found and a thorough survey of all possible sources shall be made by a qualified hydrogeologist and certified well driller.

11.1.2 Where adequate supply of non potable water is available consider separate fire protection and domestic water supply and storage systems.

11.1.3 Prior to undertaking any groundwater investigations, the local authority responsible for granting groundwater permits shall be consulted

11.2 Wells

11.2.1 Prior to undertaking any groundwater investigations, communication with local authority responsible for granting groundwater permits is required.

11.2.2 All local (municipal or provincial) well drilling requirements, including reporting requirements, shall be followed.

11.2.3 The design and construction of a well shall follow the recommendations in Health Canada's *Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction* (see footnote 1) in addition to applicable best management practices.

11.2.4 The design and construction of the well(s) shall be adapted to the geologic and the ground water conditions existing at the site of the well in order to provide a sufficient and safe water supply, and to conserve the ground water resource.

11.3 Water Treatment

11.3.1 Water treatment technologies will be designed based on the raw water analysis and results from a vulnerability assessment.

11.3.2 Treatment should aim to reduce corrosion in the distribution system while ensuring final water quality conforms to the Canadian Drinking Water Quality Guidelines.

11.3.3 Water sampling taps will be provided between each treatment technology to allow monitoring of treatment efficiency.

11.3.4 Disinfection will be applied to all finished water such that a disinfection residual in the distribution system conforms to the requirements listed in CD 318-10[3].

11.3.5 Water softening should be considered when calcium carbonate ($CaCO_3$) concentrations in the water exceed 150 parts per million or where required by authorities having jurisdiction.

11.3.6 When water softening is required consider designing a dual distribution system throughout the building, each with header type mains, i.e. a hard water and a soft water system. Connect water closets and urinals to the hard water system. Connect domestic hot water tank, boiler feed water, humidification systems, make up and fill, etc. to the soft water system.

[3] CD 318 – Guidelines 318-10 – Drinking Water Quality Management (DWQM) (2009-10-28)

SU-4 SITE UTILITIES – POWER SUPPLY AND ELECTRICAL POWER DISTRIBUTION

1. SCOPE

This section outlines the performance requirements and design guidelines for the electrical power supply and distribution system.

2. RELATED DOCUMENTS

2.1 This section should be read in conjunction with the following TCD sections as applicable:

SP–1 – Site Development
SP–4 – Site - Exterior Lighting
E–1 – General Electrical Engineering & Electrical Distribution

2.2 In addition, the Canadian Electrical Code Part I[1] will be observed as applicable:

2.2.1 Where this document is more stringent or contradicts a code or standard this document shall override. Approval from CSC must be obtained before any variations from this document are incorporated into any designs.

2.2.2 For the purpose of this document, "High Voltage" is 750 volts and above.

3. POWER SUPPLY AUTHORITY

3.1 The following details regarding the power supply available and point of connection shall be obtained from the local Power Authority.

3.1.1 System Data:

- Voltage, configuration, insulation level and neutral grounding arrangement.
- Available system short circuit present and ultimate future. Values should be both 3 phase bolted fault and line to ground fault.

3.1.2 System operating information:

- Voltage regulation.
- Operating procedures, capacitor switching
- Determine if reclosures are used and whether single or 3 phase.
- Restrictions or requirements with regard to maximum relay settings or fuse sizes at customers service for co ordination.
- Available records concerning history of failures, repair times, duration of power outages.

3.1.3 System connection information:

- Location and type of connection overhead or underground.
- Whether transformer vault required or desirable.

3.1.4 Metering information:

- Preferred method of metering primary or secondary.
- Rate structures, with allowances for high voltage connection, customer owned transformation.
- Special demand charges and power factor penalty.
- Acceptability of additive metering at more than one point on low voltage side of service, such as for dual or triple transformer station.
- Related additional charges, if any.

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1 CSA C22.1-09 – Canadian electrical code (21st edition), part I, safety standard for electrical installations

3.2 In addition to the above details, the following shall be investigated:

3.2.1 The availability of alternate supply connection.

- alternate feeder same route
- alternate feeder alternate route
- alternate feeder alternate station
- Identify power supply authority charges for any other of the above arrangements which are available.
- If available, obtain historical data concerning failure rates and repair times.

3.2.2 Study economics of customer owned versus utility owned transformer and connection voltages.

3.3 Obtain approval of the following from the local Power and Inspection Authorities having jurisdiction:

- Proposed service entrance equipment,
- Switchgear,
- Duct manhole systems,
- Direct buried or overhead systems,
- Transformers and associated equipment.

4. LOAD DETERMINATION

4.1 Carry out preliminary load study, including location of major load distribution centres.

4.2 Allow for 100% lighting load plus an appropriate demand factor on the remaining load, based on operating characteristics.

5. SERVICE LOCATION AND CONFIGURATION

5.1 Underground service is preferred.

5.2 For medium, maximum and multi security level projects underground service must be considered for voltages less than 50 kV.

5.3 Underground service is to start at least 75 meters from the compound fence. Overhead service should be limited to buildings outside the compound.

5.4 For minimum security level projects, service may be underground or overhead.

- Underground service should always be considered for voltages less than 35 kV.

5.5 High voltage main service switchgear and related distribution with or without large station transformation should be configured to recognize the following criteria:

- Minimize steps of transformation as governed by economics.
- Underground distribution is preferred between buildings and service points within the project.
- Medium, maximum and multi security level projects require all power distribution between buildings to be underground.
- in minimum security level projects, where long runs to load centre connection points occur, overhead distribution at high voltage should be considered, as dictated by economic factors.

5.6 Underground services from power supply connection to service location shall be conductors in reinforced concrete encased duct banks.

- In medium, maximum and multi security level projects, an underground distribution within the compound shall consist of conductors in reinforced concrete encased duct banks.

- Conductors shall be installed in reinforced concrete encased duct banks under all hard surfaces such as asphalt or concrete.
- Where practical, for long runs in "soft" landscaped areas of medium security projects, distribution feeder conductors between buildings or service connection points may be direct buried with suitable bedding.
- Spare ducts for future growth are a mandatory requirement. Minimum size of underground ducts should be 78 mm, with pull in ropes.
- Provide one spare duct for each pair of ducts required.
- Whenever services for medium, maximum and multi security level installations are routed under security fences, such services must be minimum 2 meters below ground level.
- Drainage of ducts and pull boxes is extremely important. Pull boxes should be connected to storm sewer drainage system.
- Underground Pull Box requirements for Power and Communications distribution should be outlined. Identify sizes, concrete, galvanized steel lids suitable for vehicular traffic, padlock able lids, identification. Wherever possible locate in non-vehicular areas.

5.7 Where service tunnels are provided for other utilities they should be used for electrical distribution wherever possible.

6. LINE CONSTRUCTION

6.1 Design and specify construction of underground service and distribution facilities and overhead lines in accordance with Canadian Electrical Code Part 3 "Outside Wiring Rules" which consist of the following CSA Standards:

- CSA C22.3 No. 1-10 – Overhead Systems
- CSA C22.3 No.3-98 (R2007) – Electrical Coordination
- CSA C22.3 No. 4-1974 (R2004) – Control of Electrochemical Corrosion of Underground Metallic Structures
- CSA C22.3 No. 7-10 – Underground systems

6.2 For wood poles reference CSA Specification Series:

- CAN/CSA-O15-05 (R2009) – Wood Utility Poles and Reinforcing Stubs
- CAN/CSA-O80 Series-08 – Wood Preservation

7. ELECTRICAL EQUIPMENT VAULTS

7.1 Where vaults for electrical equipment are required, design and specify in accordance with Canadian Electrical Code Part I and to suit local requirements of the electrical Inspection Authority.

7.2 Locate vaults for ease of access and equipment maintenance. Consider special security requirement for openings doors, vents, fences, etc.

8. EXISTING CONDITIONS

8.1 Consult available documents provided by Correctional Service Canada and locate all existing buried services shown such as electrical, telephone lines, water and sewer lines, gas mains, etc.

9. CABLES FOR OUTSIDE SERVICE

9.1 For underground, References are:

- CSA C22.2 No. 1 – Overhead Systems and Underground Systems (ie)
- CSA C68.2 – Concentric Neutral Power cables
- CSA C68.3 – Power cable with Thermoset Insulation
- CSA C22.2 No. 131 – Type Teck cable
- CSA C22.2 No. 124 – Mineral Insulated copper or aluminium Sheathed cables
- CSA C22.2 No. 51 – Armoured cables (2a, 1c)
- XLPE insulation preferred.

9.2 For overhead lines consult with the local power authority as to their specific requirements and also consider copper conductor, bare and weather resistant for low voltage, A.C.S.R. for high voltage.

9.3 References:

- I.C.E.A. P 51 432 – Copper conductor, bare and weather resistant.
- CSA C49.1 – Aluminium conductor steel reinforced (ACSR)
- CSA C49.2 – Compact aluminium conductor steel reinforced (ACSR)
- CSA C22.3 No.1-10 – Overhead systems and underground systems (ie)

10. CONDUCTOR TERMINATIONS

10.1 Specify compression connectors with bolted pad for interface to bus or aerial lug.

10.2 For high voltage cable specify outdoor type porcelain body factory produced slip on terminators, complying with *IEEE Standard 48-2009*[2].

11. CONDUCTOR TESTING

11.1 Specify that the following certified reports be supplied for all type of cables rated between 5kV and 46kV.

11.1.1 Partial discharge extinction level in accordance with *CSA Standard C68.3-97 (R2006)*[3].

11.1.2 Five minute high voltage AC test to be done in the factory in accordance with *CSA Standard C68.3-97 (R2006)* and *C22.2 No. 0.3-09*[4].

11.1.3 Insulation resistance test in accordance with C68.3-97 (R2006) and C22.2 No. 0.3-09 (see footnotes 3 and 4).

11.1.4 High voltage D.C. acceptance test for fifteen minutes after installation and before the cable is placed in regular service in accordance with C68.3-97 (R2006) and C22.2 No. 0.3-09.

11.2 Apart from the above test all conductors up to 46 kV shall undergo the other tests in accordance to their respective CSA Standard.

12. HIGH VOLTAGE SERVICE EQUIPMENT

12.1 For all high voltage service equipment specify:

- Metal enclosed switchgear assemblies in a switchboard or switchboards in accordance with CSA Standard *C22.2 No. 31-04 (R2009)*[5].

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2 48-2009 – IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500kV

3 CAN/CSA-C68.3-97 (R2006) – Shielded and Concentric Neutral Power Cables Rated 5-46 kV

4 C22.2 No. 0.3-09 – Test methods for electrical wires and cables

5 C22.2 No.31-04 (R2009) – Switchgear assemblies

- For more detailed definitions of components and assembly types refer also to *ANSI/IEEE C37.100-1992*[6].
- *Definitions for Power Switchgear.*

12.2 For large main station type configuration specify:

- Full compartmentalization for *Metal Clad Switchgear.*
- Draw out power circuit breakers.
- Copper bus.
- Main incoming switching devices unfused load interrupter type.
- Provisions for high voltage (primary) metering by utility if agreed.
- Customer metering to include voltmeter, ammeter. Provision for connection of portable monitoring and/or metering in the field for kW (kilowatt), kWh (kilowatt-hour), Power factor, harmonics, etc.

12.3 Ensure adequate space, ventilation cleanliness and moisture free to ensure against tracking.

NOTE: Special treatment for bus will be required where run through compartment walls, i.e.: high voltage insulated sleeves or grommets.

12.4 For voltages 15kV and lower, where specifying dry type high voltage main transformers "Unit Substation" type construction is preferred.

- Refer to "Unit Substation" definition in *ANSI/IEEE C37.100-1992* (see footnote 6) and *EEMAC Standard G13-1, 1978*[7].

12.5 For high voltage breakers, preference is for:

- solid state type relaying with low power requirements in trip actuating circuit thus permitting effective use of current transformer output as source of tripping power and avoiding station battery.
- also consider manual operation.
- 15kV and below specify air circuit breaker or minimum oil type. Above 15kV use minimum oil.

12.6 For small distributed type services, consider fused load interrupter type switchgear and;

- Indoor unit substation configuration up to 15kV.
- If outdoor specify full height full voltage class equipment and ensure flexible high voltage connection between switchgear and transformer.
- Outdoor switchgear and transformer installed on concrete pad, surrounded with crushed stone.
- High voltage fuses, specify "Power Fuses" as defined in *ANSI C37.100-1992*[8] and in accordance with *ANSI C37.46-2000*[9], also refer *ANSI/IEEE C37.40-2003*[10] and *ANSI/IEEE C37.41-2008*[11].
- Use E rated fuses.

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6 C37.100-1992 – IEEE Standard Definitions for Power Switchgear

7 EEMAC G13-1, 1978 – EEMAC Standard for Unit Substations

8 C37.100-1992 – IEEE Standard Definitions for Power Switchgear

9 C37.46-2000 – American National Standard for High Voltage Expulsion and Current-Limiting Type Power Class Fuses and Fuse Disconnecting Switches

10 C37.40-2003 – IEEE Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

11 C37.41-2008 – IEEE Standard Design Tests for High-Voltage (>1000 V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Fuse Links and Accessories Used with These Devices

NOTE: For grounding and fencing requirements refer to *CSA C22.2 No. 0.4-04 (R2009)*[12]

12.7 For station grounding design refer to Canadian Electrical Code Part I[13] and *IEEE Standard 80-2000*[14].

12.8 For all installations provide surge arrestors to protect power cable, switchgear and transformers. Select arrestor class and rating to suit system and voltage. Consult utility. Base selection on:

- *ANSI C62.2-1987*[15].
- Specify manufacture and testing in accordance with *ANSI/IEEE C62.1-1989*[16].

12.9 Allow for future expansion by using adequate space and access for addition of future equipment.

13. HIGH VOLTAGE TRANSFORMERS

13.1 For distribution within buildings for systems 400 kVA and over, secondary voltage normally preferred is 600 volt - 3 phase grounded wye.

- Secondary system may be 4 wires or 3 wires.

(NOTE: 4th wire or neutral should always be taken to main service switchboard and grounded. Some utilities may require the neutral for metering.)

Smaller systems may be lower voltage such as 208/120V 3 phases 4 wires subject to restrictions imposed by motor loads, etc. Unless clearly impractical 3 phase systems are preferred

13.2 When applying high voltage transformers refer to and specify in accordance with the following standards.

- Power Transformers: *CAN/CSA-C60044-5:07*[17]
- Distribution Transformers *CAN/CSA-C2.1-06* and *CAN/CSA-C2.2-06*[18]
- Dry type Transformers *C9-02 (R2007)*[19]

Apply transformer types in accordance with the following table:

Configuration	H.V. (primary)	L.V. (secondary)	Indoor	Outdoor
Main Stn.	Below 15kV	600V	Dry type C9	Power type C88
Dist. Stn.	Below 15kV	600V or lower	Dry type C9	Dist. Type C2
Main Stn.	15kV to 46kV	600V	LNAN C88	ONAN C88
Dist. Stn.	15kV to 46 kV	600V or lower	LNAN C2	ONAN C2
Main Stn.	15kV to 46 kV	600V or lower	LNAN C88	ONAN C88

12 CAN/CSA-C22.2 No. 0.4-04 (R2009) – Bonding of Electrical Equipment
13 CSA C22.1-09 – Canadian electrical code, part I (21st edition), safety standard for electrical installations
14 80-2000 – IEEE Guide for Safety in AC Substation Grounding
15 C62.2-1987 – IEEE Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating Current Systems
16 C62.1-1989 – IEEE Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits
17 CAN/CSA-C60044-5:07 – Instrument Transformers – Part 5: Capacitor Voltage Transformers
18 CAN/CSA-C2.1-06 – Single-Phase and Three-Phase Liquid-Filled Distribution Transformers
CAN/CSA-C2.2-06 – Pole-mounted, Single-phase Distribution Transformers for Electric Utilities
19 C9-02 (R2007) – Dry-Type Transformers

13.3 Transformer winding and connection arrangement generally preferred is:

- H.V. primary – Delta
- L.V. secondary – grounded wye

However, refer to *ANSI/IEEE C57.105-1978 (R2008)*[20]. Particularly note and Review possibility of Ferro resonance for each application. Where necessary to guard against Ferro resonance use connections and winding arrangements such as:

- H.V. primary – grounded wye
- L.V. secondary – grounded wye

with common ground point for both windings.

NOTE: Requirement for additional loop in magnetic circuit to compensate for negative sequence current due to unbalanced loads and specify 4 or 5 legged core.

13.4 Select transformer size to suit load

- main service configuration
- distribution system size and configuration

For 600 volt secondary, transformer size should be selected to limit maximum let through RMS symmetrical short circuit current to 34,000 amperes which implies a maximum 2500 kVA transformer with 6.5 to 7.0% impedance.

Fan cooled rating would be 3300kVA.

Refer to details for distribution system size and configuration under Section E-2 Electrical Distribution.

13.5 Specify copper windings for high voltage and low voltage. Specify temperature rise tests on all transformers. Specify BIL tests on all dry type transformers.

13.6 Ensure transformers are installed with adequate ventilation.

Oil filled transformers should be installed in a secure enclosure constructed to protect for explosion and fire.

For liquid filled transformer installation refer to *IEEE C57.93-2007*[21] (filling the transformer *IEEE C57.91-1995*[22] and *IEEE C57.91-1995/Cor-2002*[23].

For dry type transformer installation refer to *CSA C9-02 (R2007) Appendix A* [24] .

14. COMMISSIONING

14.1 Specify preparation of a load study as part of the contract. The load study is to be reviewed and commented on by the design engineer. The study is then to be submitted to CSC.

14.2 The load study is to contain full load current readings of all feeders connected to 50 ampere circuit interrupting devices and larger. Currents are to be read at the line side of the feeders if possible.

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20 ANSI/IEEE C57.105-1978 – Guide for Application of Transformer Connections in 3-phase Distribution Systems
21 C57.93-2007 – IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
22 C57.91-1995 – IEEE Guide for Loading Mineral-Oil-Immersed Transformers
23 C57.91-1995/Cor 1-2002 – IEEE Guide for Loading Mineral-Oil-Immersed transformers Corrigendum 1
24 C9-02 (R2007) – Dry-Type Transformers

14.3 The load study is to contain voltage readings taken at the load side of the feeders. Transformer taps shall be adjusted within 2% of rated voltage of equipment.

14.4 The load study is to identify loads i.e. are they motors, lighting or heating.

14.5 Specify balancing of loads.

14.6 Specify for contractor to demonstrate that systems operate as design intended them to operate and that contractor must be prepared to operate each device, such as switches, relays etc., to the satisfaction of CSC and PWC personnel involved in the acceptance procedure.

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SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations

GO AND GI PROJECTS

SECTION M – MECHANICAL

Canada

TABLE OF CONTENTS

M-4 MECHANICAL – HEATING, VENTILATING & AIR CONDITIONING REQUIREMENTS

M-1 MECHANICAL – GENERAL MECHANICAL REQUIREMENTS

1. SCOPE

This section outlines the basic mechanical engineering design criteria related to the special requirements of Correctional Service Canada (CSC).

2. RELATED DOCUMENTS

2.1 Technical Criteria Document (TCD)

M–2 to M–4 inclusive
SU–1 – Storm & Sanitary Services
SU–2 – Wastewater (Sewage) Treatment
SU–3 – Water Utility

2.2 Correctional Service of Canada - Commissioner's Directives

318-2 - Energy Measurement and Conservation
318-4 - Management of Halocarbons

3. GENERAL REQUIREMENTS

3.1 The mechanical technical criteria provided under this section describes special Correctional Service Canada (CSC) requirements and are intended to supplement the most current version of the National Building Code of Canada.

3.2 Any departure from these technical criteria shall be supported by explanation and back up data and shall receive approval by CSC NHQ-Technical Services and all authorities having jurisdiction before proceeding with the design.

4. DESIGN GUIDELINES

4.1 General

4.1.1 Design systems to minimize opportunities for system sabotage, the concealment of contraband and to facilitate the task of staff in maintaining and controlling the institution.

4.1.2 Mechanical equipment shall generally be located in specially designated buildings or rooms for mechanical equipment. Building mechanical rooms shall be located, laid-out and designed so that major equipment items such as boiler, air handlers and hot water tanks can be efficiently serviced, removed or replaced. Arrange to provide suitable opening to replace equipment. For example, a mechanical room located on a 2nd floor or higher shall be accessible from a high level exterior access door to avoid the use of interior stairwells when replacing large equipment. Layout of mechanical rooms shall be designed as to allow for replacement of equipment without the removal of other major equipment, piping or ducting.

4.1.3 Arrange location of controls, alarm accessories, indicators, valves, traps, clean-outs, etc., to prevent access by inmates.

4.1.4 Where a complex is served with connecting security walkways, tunnels or galleries, consider using these areas for running heating and plumbing pipes.

4.2 Central Control

The mechanical central control station shall be located in a room controlled by maintenance staff. Selected alarms shall be relayed to the 24 hour manned Main Communication Control Post (MCCP). The capability to change set points or programs shall not be available from the MCCP.

4.3 Service Chases

Design cell service chases for ease of maintenance and economy of space and provide large scale sectional drawings across critical points of chase. Provide a "mock up" of service chase with all services installed. The "mock up" shall be provided either by the consultant, through PWGSC, before tender, or specified to be provided by the successful contractor before commencing the installation of services. "Mock-up shall demonstrate reasonable access to all components in the chase that may require adjustment, servicing or replacement. Access to chases shall be from corridor through secured doors as described in the TCD security door criteria A-5.

5. ENERGY CONSERVATION

5.1 General

5.1.1 The level of quality of systems provided in the institution is to be consistent with achieving the lowest possible energy consumption based on life cycle cost principles. New constructions of facilities and renovated portions of facilities shall be designed so that energy use will not exceed 1400 MJ/m2/year, based on a national average of 4,700 Heating Degree-Days (HDD).

5.1.2 Prepare an energy consumption analysis during the conceptual phase of design.

5.1.3 The design shall meet all the requirements of *National Research Council Canada – Model National Energy Code of Canada for Buildings 1997* [1]

6. METERING

6.1 Provide permanent recording energy or steam flow meters in each major boiler plant, and oil or gas meters to measure fuel to the boilers.

6.2 Provide permanent meter to measure heating energy used in each major building.

6.3 Provide meters for CORCAN buildings or processes when energy usage is significant (paint baking ovens, laundry, etc...)

6.4 All meters shall be connected to the building automation system and provide both instantaneous and cumulative values.

7. FUELS

7.1 Natural gas and propane lines generally shall not be located in areas accessible to inmates. However gas may be installed where required, in kitchens, industrial areas, shops, etc.

7.2 Unless specifically requested by the project brief or project manager:

7.2.1 Propane and gasoline storage tanks shall not be installed within the perimeter security fence.

7.2.2 Vehicle fuelling stations shall not be inside the perimeter security fence.

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[1] NRC Institute for Research in Construction; National Research Council Canada -- Model National Energy Code of Canada for Buildings 1997, ISBN: 0660168979 (*new release scheduled 2011*).

M-2 MECHANICAL – PLUMBING REQUIREMENTS

1. SCOPE

This section outlines the special requirements for plumbing systems associated with Correctional Service Canada (CSC) institutions. In general, this Section covers the following:

- Drainage systems
- Domestic water
- Plumbing fixtures and trim

2. RELATED DOCUMENTS

2.1 Technical Criteria Document (TCD)

SP–1 – Site Development
SU–1 – Storm and Sanitary Servers
SU–2 – Waste Water (Sewage) Treatment
SU–3 – Water Utility

2.2 Correctional Service of Canada - Commissioner's Directives

318-9 - Water Measurement and Conservation

3. DRAINAGE SYSTEMS

3.1 Pumped Sewage

Sewage pumps should be considered only if gravity flow cannot be employed. Where such pumps are required, only the floors which cannot drain by gravity shall be pumped.

Provide duplex sewage pumps with an automatic transfer switch to alternate the unit operation, emergency power supply and high level alarm.

3.2 Blockages

In order to minimize the problem of drainage system blockage by inmates, either intentionally or in the attempt to dispose of unauthorized clothing by flushing down water closets:

3.2.1 The number and location of cleanouts in soil and waste runs and risers shall be selected to facilitate the easy removal of blockage material.

3.2.2 Where practical locate cleanouts in areas inaccessible to inmates such as janitor closets, pipe chases mechanical rooms, etc. any cleanouts in inmate areas shall be secured with tamper proof screws.

3.2.3 In inmate housing units, below grade or concealed drain lines from water closets shall be a minimum of 150 mm.

3.2.4 Consideration shall be given to provide a screen, or sewage grinder to remove large objects, ie. clothing, from sewage before connection to sewage treatment system.

3.3 Floor Drains

3.3.1 Provide floor drains in corridors and cell runways, normally one per housing wing, located away from traffic areas.

3.3.2 Floor drains in areas occupied by inmates shall have grates secured with vandal proof screws.

3.3.3 To reduce the possibility of hiding or disposing of contraband, grate openings in inmate areas shall consist of multiple holes approximately 10 mm in diameter.

3.4 Traps

Exposed traps are not permitted in inmate areas.

3.5 Chases

Where 2 cells share a common service chase, water closet connections to main stack in chase must be designed with a "Y" in order to prevent "fishing" of contraband from a cell to another.

4. DOMESTIC WATER QUANTITIES

Refer to Technical Criteria section SU-3 Water Utilities.

General note: an electrically operated valve must be provided to shut off domestic water supply in case of a disturbance in a unit. Valve to be operable from the control post.

5. HOT WATER GENERATION

5.1 Temperature Requirements

5.1.1 Water shall be delivered at the following temperatures:

- 5.1.1.1 Lavatories and janitors service sinks: 38°C.
- 5.1.1.2 Clinical areas: 43°C.
- 5.1.1.3 Food Services; general use 60°C with booster to 82°C where required by health regulations.
- 5.1.1.4 Washing machines: No hot water
- 5.1.1.5 Showers: 43°C for shower with hot and cold supplies
  40.5°C maximum for showers with tempered supply only.

5.1.2 Temperature control and mixing valves shall not be accessible to inmates and shall be provided with temperature adjusting knob and dial thermometer to measure discharge temperature.

6. FIXTURE AND FITTINGS

6.1 General

6.1.1 The connecting levers from a lavatory "pop up" waster can readily be turned into a stabbing device. Do not specify this type of fitting within the institution fence including the administration washrooms.

6.1.2 Flush valves must be provided for all fixtures. Reservoirs are not acceptable.

6.2 Health Care Centre (all levels)

6.2.1 Dispensary and dental operating – General purpose 302 stainless steel sink 1.0 mm thick nominal 530 x 530 x 175 mm self rimming, ledge back with under-coating and swing spout aerator tip supply with indexed hooded handles and basket strainer.

6.2.2 Dental laboratory; general purpose sink as above but with plaster interceptor.

6.2.3 Examination room; hospital type lavatory and general purpose sink.

6.2.4 Treatment room; scrub up sink. V.T. Wall hung 559 mm x 483 mm lavatory with integral back, wall carriers, rigid gooseneck sport, aerator and 100 mm indexed blade handles, drain plug and perforated strainer.

6.2.5 Washrooms; vitreous china prison type WC complete with seat and prison type lavatory.

6.2.6 Cells; vitreous china prison type WC complete with seat and cover and prison type lavatory.

6.2.7 Fit one WC in the area, but not in a cell, with bed pan washer and lugs.

6.3 Maximum Institution

6.3.1 Cells: stainless steel WC and lavatory with pushbutton valves.

6.3.2 Segregation cells: stainless steel WC and lavatory with pushbutton valves.

6.3.3 Inmate washrooms in dining areas, gymnasiums, visiting area, work spaces, library, etc., stainless steel prison type fixtures with concealed water supplies, pushbutton operated concealed flush valves, and pushbutton hot and cold water supplies for lavatories. Access for maintenance shall preferably be from pipe chase but if this is not practical from security type access box.

6.3.4 Showers: Stainless steel shower panel with chrome plated 12 1/2° tamper proof shower head with 9ℓ/min control and pneumatically activated pushbutton valve. Single temperature tempered water supplied to showers, thermostatically controlled from remote position in non inmate area. Thermostatic mixing valve shall compensate for both temperature and pressure.

6.4 Medium Institution at S-4 & S-5 Levels

6.4.1 Cells: vitreous china prison type WC with seat and prison type vitreous china lavatory.

6.4.2 Segregation cells: stainless steel WC and lavatory.

6.4.3 Inmate washrooms in dining areas, gymnasiums, visiting areas, work spaces, library, etc., vitreous china prison type fixtures. Water closet with seat. Water supplies and flush valves shall be as specified in 6.3.3.

6.4.4 Showers: see 6.3.4.

6.5 Medium Institution at S-3 Levels

6.5.1 Bedroom: no plumbing; Common washrooms: vitreous china prison type WC with seat and cover and prison type vitreous china lavatory.

6.5.2 Segregation cells; stainless steel combination WC and lavatory.

6.5.3 Inmate washrooms in dining area, gymnasium, visiting area, work spaces, library, etc. shall be the same as in 6.4.3.

6.5.4 Showers: Institutional grade valves, hot and cold water supplied to showers. Thermostatic mixing valve shall compensate for both temperature and pressure.

6.6 Minimum Institution

Institutional grade fixtures. WC with flush valve.

6.7 Drinking Fountains

6.7.1 Fully or semi recessed type in all areas.

6.7.2 Do not provide refrigerated drinking fountains in inmate occupied areas.

6.8 Urinals

6.8.1 Urinals in inmate areas where stainless steel W.C. are specified shall be wall hung S.S. or specified in clause 7 with concealed flush valve if backing on pipe chase and exposed flush valve if no chase is available.

6.8.2 Urinals in inmate areas where vitreous china W.C. are specified shall be wall hung with concealed flush valve. If pipe space is not available for flush valve provide security access box as specified in 7.5.

6.9 Service Sinks

6.9.1 Since floor receptor type service sinks are less subject to damage through inmate use, they shall normally be specified.

6.9.2 Where it is architecturally impractical to design floor receptors, specify standard mop or service sinks with rim guard and wall mounted fittings.

6.9.3 All mop and service sink faucets shall be provided with a built-in vacuum breaker.

6.10 Pushbutton valves (showers and lavatories)

Pushbutton valves shall be vandal resistant metering type valves, flow adjustable in chase from 5 to 60 seconds; metering cartridge shall be serviceable from pipe chase without disconnecting inlet supply and no inlet water shall flow through timing mechanism; .

6.11 Access box

Security type access box shall have 1.9 mm type 304 stainless steel cover secured with vandal resistant screws.

Frame shall be 0.90 mm galvanized steel frame with back mounting flange and front reinforcing hemmed edge.

M-3 MECHANICAL – FIRE PROTECTION REQUIREMENTS

1. SCOPE

This section outlines the special requirements for fire protection associated with Correctional Service Canada (CSC) institutions.

2. RELATED DOCUMENTS

2.1 This section should be read in conjunction with the following Technical Criteria Document (TCD) sections as applicable:

G–2 – Fire Authorities and Classification
A–13 – Control Posts
E–6 – Emergency Electrical

2.2 In addition the following standards and guidelines shall be observed as applicable:

- National Building Code of Canada
- National Fire Code of Canada
- FC 343 Fire Commissioner Canada – Correctional Institutions
- FC 410 Fire Commissioner Canada – Fire Alarm Systems
- FC 403 Fire Commissioner Canada – Sprinkler Systems
- PWC Standard and Guideline MD 15500 – Fire Protection National Master Specification (NMS) Division 15.

3. GENERAL DESIGN REQUIREMENTS

3.1 Firefighting equipment in living unit and inmate circulation areas shall be designed for maximum control by staff. Design systems to minimize opportunities for vandalism and sabotage, the hiding of contraband and the use of the system or system components as weapons.

3.2 The fire standpipe system should be combined with the automatic sprinkler system in order to economize on the distribution piping. Piping and valving shall be such that the sprinklers on a range or portion can be shut off after a fire or vandalism to permit repair yet still permit operation of the fire standpipe and hose cabinets in the area.

4. STANDPIPE AND HOSE SYSTEM

4.1 Where Required

Standpipe and hose systems shall be installed in all locked Living Units and in all buildings of more than 3 storeys or 14 m in height and of 3 storeys or 14 m or less in height when the building area exceeds the following with no exemption to sprinklered buildings:

Height (Storeys)	Area (m^2)
1	2000
2	1500
3	1000

4.2 Non Inmate Locations

Fire hose and cabinets, not in inmate housing units or other inmate oriented spaces, shall be unlocked standard type as required by National Building Code of Canada (NBC) except door shall be solid steel without a glazed viewing panel.

4.3 Minimum Institutions

Fire hose cabinets in housing units shall generally be standard type to meet National Building Code of Canada. However, since standard type soft hose must be fully extended before water will flow, consideration should be given to installing hard rubber hose on continuous flow reels if building configuration will not readily allow this full extension. Cabinets shall be unlocked.

4.4 Medium and Maximum Institutions

In institution living areas, inmate circulating corridors and other inmate oriented spaces such as gymnasium, classrooms, library, vocational shops industries etc. provide standpipe and hose system as follows:

4.4.1 Fire hose cabinet shall be of steel, recessed where possible, with solid steel door without viewing window and shall be equipped with a 65 mm hose connection for fire department use and a 38 mm connection with adapter to 25 mm hose. Cabinet shall not contain a hose wrench as it may be used as a weapon.

4.4.2 The hose shall be 25 mm inside diameter rubber not exceeding 30 m in length and shall be mounted on a continuous flow hose reel. Water shall be admitted to the hose reel by a manually operated valve in the cabinet or in the line feeding the cabinet. Use of an automatically operated valve admitting water to the hose reel is not permitted as they can inadvertently shut off the water if several metres of hose is reracked. The hard rubber hose is required because, unlike the standard soft hose, it cannot be easily slashed and if it is damaged it can be readily detected by visual inspection.

4.4.3 Fire hose nozzle shall be 25 mm size constructed of brass and shall be easily adjusted under all pressures through the complete range of, off, fog straight stream and washdown stream.

4.4.4 Fire hose cabinets at S-3 and S-4 Levels shall be unlocked.

4.4.5 At S-5 to S-7 Levels, to prevent inmate misuse of the hoses, the following features are required:

4.4.5.1 Provide means to shut off the water to the living unit hose cabinets from within the security control post. This is to be accomplished by either having electrically supervised manual shut off valves in the post or by ULC certified electrically controlled valves installed in a secure area, with switch in the control post.

4.4.5.2 Provide means to shut off the water to the cabinets in the inmate circulating corridor and inmate oriented spaces from a secure area, without disrupting the water supply to sprinklers or fire hose cabinets in other areas. Shut off to be either electrically supervised manual valve or ULC certified electrically controlled valve.

4.4.5.3 The cabinets shall be specially designed of heavy steel so that inmates cannot force open the door for unauthorized use. The doors shall either

be secured with padlock or preferable, if cabinet can be recessed into security control post, a locking latch operable only from within the control post. If padlocks are used all doors shall be keyed alike. Padlocks and hasps are to be used on cabinet doors rather than cylinder locks or security type locks, since they can be broken off to gain access if the key slot is plugged with foreign matter or key is misplaced. The padlocks shall be provided by the owner.

4.5 Identification

Cabinet doors shall be identified with graphic symbols or bilingual sign reading FIRE HOSE.

5. FIRE EXTINGUISHERS

5.1 General

Fire extinguishers shall be installed in accordance with National Fire Code of Canada requirements except as required in this section.

5.2 Water Type

5.2.1 Shall be pressurized type of 9 ℓ capacity.

5.2.2 For Maximum Institution and Medium Institution at S-5 Level, extinguishers required in living units, inmate circulating corridor and gymnasiums shall be in locked cabinets. Locks shall be as for fire hose cabinets and all keyed alike.

5.2.3 A water extinguisher shall be provided in every hose cabinet and generally shall be located so that the travel distance to an extinguisher does not exceed 23 m. However in areas requiring locked cabinets, subject to the approval of HRSDC – Fire Protection Engineering, permission may be given to increase the distance between extinguishers so that they will only be required in each fire hose cabinet.

5.3 Dry Chemical Type

5.3.1 A 5 kg or equivalent multipurpose dry chemical extinguisher shall be installed in workshops or similar areas where flammable or combustible liquids are stored or handled. They shall be located so that at least 1 extinguisher is within 15 m of hazardous areas.

5.3.2 Dry chemical extinguishers must be of the stored pressure type. Cartridge operated extinguishers are not permitted as the cartridge could be used a weapon.

5.4 Carbon Dioxide Type

Carbon dioxide extinguishers of 5 kg or equivalent capacity shall be provided for the protection of electrical and electronic equipment. They shall be located so that at least 1 extinguisher is within 7.5 m of such equipment.

5.5 Class K Wet Chemical

5.5.1 Class K fire extinguishers shall be provided for hazards where there is a potential for fires involving combustible cooking media (vegetable or animal oils and fats). A Class "K" wet chemical portable extinguisher of 6 L capacity shall be installed

within 10 m of all commercial cooking appliances producing grease laden vapours.

5.5.2 A sign shall be posted next to the Class K extinguisher stating the "Fixed extinguishing system shall be operated prior to the use of the Class K portable extinguisher." This is required to isolate the fuel or energy source associated with the cooking appliance.

5.6 Clean Agent

Listed special purpose clean agent portable extinguishers shall be provided for the protection of areas involving fine electronic equipment such as in central computer rooms in RHQ and NHQ and in MCCP/CER's. Dry chemical extinguishers shall not be used for protection of MCCP/CER's.

5.7 *Supplier*

The location of all fire extinguishers shall be shown on the contract drawings. However, CSC shall supply and install all hand extinguishers that are not required to be located in a cabinet.

6. SPRINKLER SYSTEM

6.1 Location

Sprinkler systems shall be installed in all Living Units; in all new buildings and in buildings receiving major renovations except:

6.1.1 Sprinklers may be omitted from small detached buildings in which, in the opinion of HRSDC – Fire Protection Engineering, there is no life hazard and which do not constitute an exposure hazard to the principal functional areas of the institution.

6.1.2 Sprinklers may be omitted from detached buildings intended for use by occupants having free access, where such buildings are:

6.1.2.1 Not more than two storeys in height and less than 500 m^2 in area, or

6.1.2.2 One storey in height and less than 1000 m^2 in area.

6.2 Type

Sprinkler systems shall be generally of the wet type with the following exceptions:

6.2.1 Dry type system is to be used in areas subject to freezing.

6.2.2 Preaction type as called for in clause 7 shall be installed in the Main Communication and Control Post (MCCP).

6.3 Zone Shut Off Valves

Since in inmate oriented areas sprinkler heads are more likely to be activated, either because of vandalism or purposely set fires, than in a standard building, provide electrically supervised manually operated control valves to aid in quickly shutting off the water without disrupting sprinkler protection to other areas of the building after it has been determined that sprinkler fire suppression in the immediate area is not required. These control valves shall be capable of quickly restoring water to the system if a fire is started in the affected area.

6.3.1 The zone valves shall be located in secured areas.

6.3.2 Each zone controlled by a shut off valve shall have an alarm and flow switch.

6.3.3 Provide a minimum of one shut off valve for each cell block wing. Further subdivision of zoning to each side of the range and upper and lower floors is desirable if feasible.

6.4 Sprinkler Heads

6.4.1 Sprinkler heads in cells must be of the type which cannot be used to secure or anchor a rope like object to be used by the inmate for self destruction by hanging. If a rope or string can be secured to the head it shall not support a weight of more than 50 kg without breaking or operating the sprinkler system.

6.4.2 Provide guards on heads in MCCP, Janitor Closet and electrical and mechanical rooms.

6.5 Water Gong

The outside water motor gong may be omitted from buildings when all parts of the perimeter of the building are within the secured area, and the transmission of an alarm to a continuous manned facility is provided.

7. MAIN COMMUNICATION CONTROL POST (MCCP)

7.1 Where the building containing the Main Communication and Control Post (MCCP) and Communication Equipment Room (CER) is required to be sprinkled, the System in these rooms shall be of the pre action type, activated by heat detectors installed at ceiling level. An easily accessible, electrically supervised manual sprinkler control valve shall be located near the exit from the MCCP.

7.2 An underfloor suppression system (HALON) is not required.

7.3 15 lb CO_2 fire extinguishers shall be provided at the exit from the MCCP and CER rooms.

7.4 Ventilation for the UPS battery units shall be provided in accordance with Canadian Electric Code C22.1[2].

8. WATER SUPPLIES

8.1 The water supply in litres per second for correctional institutions shall be not less than two times the square root of the largest single floor area in square metres, to a maximum of 130 ℓ/s. Floor area means the space on any storey of a building between exterior walls and required firewalls.

8.2 The water supply stipulated in (.1) shall be available for a period of not less than 2 h.

8.3 Every hydrant shall be capable of flowing not less than 30 ℓ/s of water at a residual pressure of not less than 450 kPa (gauge).

8.4 Water supply capacity for buildings shall be sufficient to meet the requirements for sprinkler systems and standpipe and hose systems.

8.5 Fire protection water supply entry into buildings shall be controlled with an above ground post indicator valve (PIV).

8.6 When available, the water supply shall consist of 2 separate connections from a municipal water works system.

8.7 When a municipal water works system is not adequate to meet the requirements stipulated in the previous clause, it shall be augmented by on site water supply from tanks or reservoirs with at least 2 fire pumps. Each fire pump shall be capable of supplying the water supply requirements based upon 120 percent of its rated capacity.

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[2] CSA C22.1-09 – Canadian electrical code, part I (21st ed.), safety standard for electrical

9. FIRE PUMPS

9.1 Fire pumps shall be automatic in operation and arranged to remain in operation until manually shut down.

9.2 Fire pumps shall be electrically interconnected with the fire alarm system such that their operation is indicated at the central alarm and control facility.

9.3 Where adequate standby power is available the two fire pumps shall be driven by electric motors with at least one of them connected to the emergency power supply.

9.4 Where it is not feasible to provide reliable standby power, one pump shall be electrically driven and the other shall be driven by an internal combustion engine.

10. LIVING UNIT SMOKE CONTROL

10.1 Since for security reasons it is preferable during a minor fire to protect the inmates in their cells rather than evacuating the living unit, the following controls shall be provided.

10.1.1 Manual emergency switches, overriding other controls, will be located in the control post to control the supply fans and the exhaust or return fans.

10.1.1.1 The supply fan switch shall be capable of shutting off air supply to the wing or providing supply air with no recirculation of air from the wing being controlled.

10.1.1.2 The exhaust or return fan switch shall be capable of shutting down all exhaust or return from the cells or exhausting 100% of the air to the outside.

10.1.2 A smoke detector in the return air duct shall automatically shut down supply fan when smoke is present and turn return fans to 100% exhaust.

10.2 Control post personnel with the overriding controls shall operate system as required. They can, for example, provide supply air to a wing to quickly clear the smoke so that the wing need not be evacuated if there is no danger of this fanning the fire.

11. CELL SPRINKLER HEADS

Cell sprinkler heads Standard of Acceptance:

11.1 Pendant Type

11.1.1 Tyco Raven Quick Response Pendant Institutional Sprinkler.

11.1.2 Viking HQR-2 Institutional Quick Response Pendant.

11.1.3 Reliable - RASCO PEND ZX-SR-INST

11.1.4 Viking Horizon Model H Residential/Extended Coverage Pendent Sprinkler.

11.2 Side wall Type

11.2.1 Tyco Raven Quick Response Horizontal Sidewall Institutional Sprinkler.

11.2.2 Reliable – RASCO HSW ZX-SR-INST

11.2.3 Viking - HQR-2 Institutional Quick Response Pendant

M-4 MECHANICAL – HEATING, VENTILATING & AIR CONDITIONING REQUIREMENTS

1 SCOPE

This section outlines the basic HVAC criteria for Correctional Institutions and provides design guidelines for these systems.

2 RELATED DOCUMENTS

2.1 This section should be read in conjunction with the following TCD sections as applicable:

A–3 – Architecture – Grilles, Screens & Modesty Barriers,
A–8 – Architecture – Building Acoustics
M–1 – Mechanical – General Mechanical Requirements, and
E–6 – Electrical – Emergency Electrical

2.2 In addition the National Master Specification (NMS) for HVAC, Division 15000 shall be observed as applicable.

3 ENVIRONMENTAL COMFORT LEVELS

Ventilation systems shall be designed as per ASHRAE guidelines and ASHRAE standards 55[1] and 62[2].

4 AIR CONDITIONING

4.1 Mechanical cooling shall be provided in the following areas:

- 4.1.1 Office areas
- 4.1.2 Security control posts, duty rooms, etc...
- 4.1.3 Food services supervisor and general offices
- 4.1.4 Observation towers
- 4.1.5 Computer equipment and telecommunication rooms.

4.2 Except as provided in 4.3, air conditioning shall not be provided in inmate occupied areas unless special approval has been obtained from NHQ – Technical Services.

4.3 Exceptions

- 4.3.1 Hospitals and Health Care Centres including related cells.
- 4.3.2 Industrial areas where processes performed require temperatures which cannot be maintained without mechanical cooling.

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1 ANSI/ASHRAE Standard 55-2010 – Thermal Environmental Conditions for Human Occupancy (ANSI approved) – American Society of Heating, Refrigerating and Air-Conditioning Engineers / 2010 / 40 pages – AMENDED by ANSI/ASHRAE 55-2010 Errata (15-11-2010), ASHRAE 55-2010 Errata (2-18-2010)

2 ANSI/ASHRAE Standard 62.1-2010 – Ventilation for Acceptable Indoor Air Quality (ANSI Approved) American Society of Heating, Refrigerating and Air-Conditioning Engineers / 2010 / 54 pages – AMENDED by ANSI/ASHRAE 62.1-2010 Errata , Interpretation IC 62.1-2007-21 of ANSI/ASHRAE Standard 62.1-2007 ventilation for Acceptable Indoor Quality , Interpretation IC 62.1-2007-20 of ANSI/ASHRAE Standard 62.1-2007 Ventilation for Acceptable Indoor Quality , ANSI/ASHRAE IC 62.1-2010-1
ANSI/ASHRAE Standard 62.2-2010 – Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings (ANSI/ASHRAE Approved) American Society of Heating, Refrigerating and Air-Conditioning Engineers / 2010 / 16 pages – AMENDED by ANSI/ASHRAE 62.2-2010 Errata , ANSI/ASHRAE IC 62.2-2010-1 , ANSI/ASHRAE IC 62.2-2010-2 , ANSI/ASHRAE IC 62.2-2010-3

5 HEATING PLANT

5.1 Guidelines

Investigate and provide cost study of alternative heating methods, heating medium and fuels, and recommend specific systems at the conceptual design stage, giving sufficient supporting data to justify recommendations taking the following items into consideration.

5.1.1 For ease of operation and maintenance, preference is to be given to low or medium temperature hot water heating systems. Steam or high temperature hot water systems shall be avoided.

5.1.2 Plant economic design evaluation shall take into account the level of operator and length of time of mandatory supervision required by the Provincial boiler and pressure vessel regulations.

5.1.3 To facilitate maintenance, especially in plants not requiring 24 hr supervision and to eliminate or shorten underground distribution lines, the preferred location of the boiler plant is within the institution fence adjacent to the Works and Engineering Section of the complex.

5.1.4 In campus style institutions, consider designing the heating system with separate boilers for individual buildings or small groups of adjacent buildings. CSC promotes the installation of geothermal systems, solar panels, direct contact heat exchangers, etc.

5.1.5 Buried underground heat distribution systems:

5.1.5.1 Consideration should be given to installing insulated heating pipes on a continuous concrete pad slightly below grade covered with inverted "U" precast concrete box, polyethylene and 300 mm of earth. Consider summer boilers where the summer load is low compared to the winter load and avoid systems requiring long heat distribution lines to be kept energized to provide a small summer load.

5.2 Boiler Standby

5.2.1 For Medium and Maximum institutions, boilers shall be sized so that if one boiler fails, comfort conditions in the critical spaces can be maintained and other areas of the complex can be kept above freezing under winter design conditions.

5.2.2 If separate boilers in the same boiler room are used for space heating, process heating, and domestic hot water, review the possibilities and cost of interconnecting the boilers to allow for maintenance and repairs while still providing all services.If electrical heating is used, standby heating to satisfy conditions outlined in 6.2 shall be provided in the event of a main power failure.

5.3 Fuel

5.3.1 Investigate the availability and reliability of alternate fuels and prepare a comparison of heating costs and recommendations.

5.3.1.1 Investigation to include possibility of using combination of fuels such as oil and gas to obtain interruptible gas rates, off peak electrical use with oil or gas etc.

5.3.1.2 Cost comparison to include total owning and operating costs including capital, maintenance, staffing, and fuel costs.

5.3.2 Where local fuel delivery is readily available provide a minimum fuel storage capacity of seven days based on the period having the maximum continuous heating load. Use a fourteen day period minimum where local delivery may not be reliable.

6. HEATING AND VENTILATION

6.1 General

6.1.1 Ceiling Access

Keep to a minimum the installation of equipment such as mixing boxes, dampers, forced flow heaters etc., in ceiling spaces in inmate oriented areas. If equipment must be installed in ceiling spaces of these areas:

6.1.1.1 Access panel must be secured so that special tools are required for removal.

6.1.1.2 Where possible equipment shall be serviceable from the bottom with the equipment directly over the access panel preventing access into the ceiling space.

6.1.2 Roof Top Units

Because of operating and maintenance difficulties, roof top units, without heated service spaces, normally shall not be installed in locations with severe winter climate.

6.2 Cells

6.2.1 Comfort Condition

6.2.1.1 To ensure comfort levels are maintained in the cells: provide sufficient zoning so that cells with different exposures have separate temperature controls.

6.2.1.2 Design air supply to eliminate drafts in occupied space taking into consideration that the cells are small, the occupant spends considerable time in the cell, is not able to rearrange the furniture to avoid a draft, and the grills must meet security requirements thus limiting adjustability and air diffusion.

6.2.1.3 Temperature control must be designed so that one occupant cannot upset the temperature of adjacent cells by opening his window, closing off his return air grille, providing heat source to a thermostat etc.

6.2.1.4 The system shall be designed to keep the temperature in the cells between 21°C and 23°C during the heating season.

6.2.2 Ventilation in wet cells

6.2.2.1 Exhaust rates as per ASHRAE standard 62 (see footnote 1).

6.2.2.2 Cells shall be maintained with negative pressure

6.2.2.3 Heat exchangers shall be provided in order to recover heat from exhaust air.

6.2.3 Security

In Medium and Maximum Institutions, since inmates spend much of their time in the cells unsupervised, cell heating and ventilation systems shall meet the following requirements:

6.2.3.1 Supply and exhaust grilles in Maximum Institutions must not be removable from within the cell. In Medium Institution, if it is not practical to design systems so that grilles are not removable from inside the cell, use security fasteners so that special equipment is required to remove the grilles.

6.2.3.2 For cells with combination S.S. fixture consider using integral punched grille for return, exhaust or supply air.

6.2.3.3 Installation shall minimize the possibility for occupant to anchor a string or rope to use for self destruction by hanging. Grilles with bars or heavy screens installed in the ceiling will not be acceptable. The installation of S-vents or a similar type of grill is to be considered.

6.2.3.4 Limit the opportunity for inmates to hide contraband in grilles or heating units. No access panels or cleanouts shall be installed in cells.

6.2.3.5 Valves, thermostats, air vents etc. shall be adjustable and serviceable from outside the cells.

6.2.3.6 Grilles or heating units must be ruggedly constructed to resist abuse and to minimize possibility of them being used as weapons. Grilles to have close grid openings to discourage hiding of contraband. Check with project manager to determine whether grilles will be part of the contract or whether they will be manufactured by CSC Industries and supplied by the owner.

6.2.3.7 Ductwork to adjacent cells shall be divided so that there is a minimum of four 90° elbows between cells to impede verbal communication and the exchange of contraband. If service chase is used as return air plenum, provide stub duct from each cell with 90° elbow and minimum 400 mm length of duct.

6.2.3.8 Floor grilles shall not be specified as they can be used to aide in fermentation to produce wine, conceal and pass contraband, collect dust, dirt and will collect water if sprinkler system is activated.

6.2.4 Heating

6.2.4.1 In many of our existing institutions cell temperature control is accomplished by thermostatic sensors, in the return air ducts from one or more cells, controlling zone values or mixing dampers. This has not been fully satisfactory for the following reasons:

a) An occupant may purposely change the temperature of neighbouring cells by opening his window, hanging a wet towel on his return air or adding a heat source, i.e. hair dryer, to the return air.

b) Occupants have a habit of covering their supply and exhaust grilles upsetting the temperature control.

c) Not all occupants wish to have their cells at the same temperature and may wish changes from day to night. If one occupant opens a window to cool his cell the system will provide more heat to all cells thus causing others to overheat and open windows.

6.2.4.2 One method of overcoming these cell temperature control problems is to install a floor radiant system.

6.2.4.3 To minimize hiding contraband the grilles in the convector cabinet shall consist of round holes not more than 6 mm in diameter.

6.2.4.4 Convector damper shall be sliding type that can be manually adjusted from fully open to complete closure to convector top openings and shall have a small knob not removable from cell side of cabinets. Design of the knob shall be such to make it impossible to secure a rope for self destruction by hanging.

6.2.4.5 Convector cabinet shall be constructed of minimum 2.6 mm steel, shall run wall to wall. Top shall be supported by wall strip hangers, and bottom shall be secured with security screws or pop rivets to floor mounted angle iron. The angle iron shall run the total length of the cabinet and shall be secured to the floor inside the cabinet.

6.2.4.6 No valves, air vents or any other fittings that may require maintenance shall be installed in the cell cabinets.

6.2.4.7 Cabinets must be secured in place so that they can only be removed by service personnel with special tools, drills, etc.

6.2.4.8 It is recommended that the amount of cell radiation installed be based on lower water temperatures than used for designing the rest of the building as cleaning of fins will be very difficult and should fins become dirty over time, cell temperature could still be maintained.

7. CONTROLS

7.1 Thermostats and sensors

Since occupants will attempt to sabotage the heating system operation, thermostat and sensor type and location, in inmate oriented areas, must be carefully chosen using the following guidelines:

7.1.1 Thermostats shall not be located in cells.

7.1.2 Any type of standard guard is likely to be breeched.

7.1.3 Consider installing temperature sensors in return air ducts.

7.1.4 For forced flow units consider installing sensor within the cabinet.

7.1.5 Locating sensors above the reach of inmates may be acceptable.

7.1.6 Sensors shall not be located so that one inmate in his cell can affect the temperature of a neighbouring cell.

7.2 Building automation system (BAS)

Controls for HVAC systems shall be accessible on the CSC network for technical services personnel. The controllers and command posts shall not be accessible to inmates.

The BAS specification shall require a widely used Industry Communication standard. Systems shall be sourced from established manufacturers with a track record of long term system support.

8. SECURITY GRIDS

8.1 Location

8.1.1 Steel security grids are required in Medium and Maximum Institutions to prevent inmate movement through ducts which have a minimum dimension larger than 125 mm and a total cross sectional area greater than 54000 mm^2 if the ducts pass from:

8.1.1.1 One major inmate department to another.

8.1.1.2 Inmate area to non inmate area.
8.1.1.3 Inmate area to outside.
8.1.1.4 Outside to MCCP or Guard House.

8.1.2 The duct work design shall minimize the number of openings requiring security grids and there shall be no duct openings larger than 54000 mm² through control post walls or ceilings.

8.2 Construction

The security grids shall be as follows:

8.2.1 Structural quality steel bars not less than 12 mm diameter on 137 mm centers (2 radius of 6 mm plus a 125-mm gap = 137 mm), except that where the opening is between an inmate area and a security corridor the bars shall be of Tool Resistant Homogenous Steel.

8.2.2 Maximum bar length without cross bars not to exceed 610 mm and all bars shall be welded together where they intersect.

8.2.3 Bars to be welded to a flat steel frame secured to masonry/concrete. Acceptable method: bolts set a minimum of 50 mm into expansion shields. Bolt spacing not exceeding 400 mm on centers. No less than 4 bolts per grille.

8.2.4 Refer to TCD Section A-3 "Grilles and Screens" for steel specifications.

8.3 Mechanical Room Openings

Exterior Openings in mechanical rooms for air intake, exhaust, etc. in Maximum Institution and Medium Institution at S-5 Level which are less than 3.5 m above grade or accessible roof, shall be protected against entry by security grids. Exterior openings in mechanical room in Medium Institution at S-3 or S-4 Level and those more than 3.5 m above grade in Maximum Institution and Medium Institution at S-5 Level shall have louvers securely fastened in place with fastenings removable only from the interior but need not have security grids.

8.4 Security Corridor

Locate ducts so that the number of openings required, through the security corridor walls larger than 54000 mm², are kept to a minimum.

8.5 Grilles

8.5.1 Aluminum bars from ventilation grilles have been used by inmates to fabricate contraband knives. These aluminum knives are not picked up by the metal detector.

8.5.2 To reduce the chance of this occurring, all grilles in inmate oriented areas such as kitchens, dining areas, workshop, inmate corridors, recreation areas, library, chapel etc., that are less than 3.4 meters above the floor shall be made of steel or iron in all medium or higher level institutions.

9. SMOKE AND TEAR GAS CONTROL

9.1 General

Chemical agent (tear gas) may be used for riot control in inmate occupied areas and corridors with inmate movement. The ventilation systems should be designed to minimize the spread of tear gas laden air to non inmate areas remote from the source.

9.2 MCCP

Special attention should be given to the design of the ventilation system in the main communication control post as this post must stay in operation at all times, and tear gas will have an adverse affect on equipment and systems should be designed so that the MCCP will not become contaminated by gas or smoke from inmate areas and the room should have a positive pressure compared to the surrounding spaces.

9.3 Health Care Unit

The health care unit shall have a separate ventilation system to ensure that neither the cells nor the operations area will be contaminated if tear gas is used in other areas of the institution.

9.4 Control Post

Design of the Security Control Posts ventilation system in Maximum Institution and Medium Institution at S-5 Level shall prevent the control posts from being contaminated by smoke or tear gas from inmate oriented areas of the institution. Secure refuge areas behind D Level posts must meet this standard. The control post shall be maintained with positive pressure to avoid any contamination.

9.5 LU System Design

For "protecting in place" during a fire and to facilitate tear gas use and purging, the ventilation system in Medium and Maximum living units (LU) shall be designed with the following features:

9.5.1 In order to prevent cross contamination or the necessity to shut down systems serving a number of ranges when a fire occurs or tear gas is used, each living unit shall be equipped with powerful wall mounted end of unit exhaust fans. Consideration shall be given to having separate ventilating units serving each living unit wing. Submit cost and design implications of this requirement at preliminary design submission stage.

9.5.2 For each cell ventilation system provide two 3 position ("OFF"-"AUTO"-"ON") manual switches in the control post to control the supply and return fans separately. Refer to TCD section E-6.

9.5.2.1 In the "AUTO" position system shall operate normally being controlled by the building control system.

9.5.2.2 The "OFF" position shall over ride all other controls and shut systems down.

9.5.2.3 When return fan is in "ON" position it shall exhaust 100% to outside.

9.5.2.4 When supply fan is in "ON" position it shall supply air to the living unit but shall not recirculate air from the wing being controlled.

9.5.2.5 Red indicator light shall be on when switch is not in "AUTO" position to indicate abnormal system status.

9.5.2.6 Since these controls are for emergency use only and will seldom be used:

a) Design supply system to minimize possibility of coil freeze up but size supply heating coil for normal operation not for 100% outdoor air at winter design conditions.

b) Consider recirculating air from other areas of the building when supply fan is in "ON" position.

c) Freeze protection shall override "ON" position of supply fan to prevent coil freeze up.

9.6 L.U. System Operation

During tear gas use

9.6.1 Before using tear gas turn supply and return fan switches to "OFF".

9.6.2 To purge area turn both switches to ON.

10. SPECIAL VENTILATION

10.1 Smudging

This section provides guidelines for the physical implementation of additional ventilation in rooms that have been designate to allow smudging[3].

10.1.1 Requirements for smudging designation

10.1.1.1 Spaces that have are acceptable to be designate for smudging are:

a) Program rooms/classrooms that are in a standalone building or/and isolated wing of a building, (The acceptable ratio of one designated smudging room for every ten program rooms/classrooms and only where aboriginal inmate numbers warrant such a room).

b) Rooms in a standalone Aboriginal Cultural Centre or building (only where aboriginal inmate numbers warrant such a centre or building).

c) Parole Hearing rooms (only where aboriginal inmate numbers warrant such a centre or building).

10.1.1.2 Spaces that are not acceptable to be designated for smudging are:

a) Inmate cells, bedrooms or dormitories.

b) All accommodations buildings or spaces except as noted above where the space is in an isolated wing of a building.

c) All administration and offices buildings/spaces.

d) All food service, health and V&C buildings/spaces.

e) All institutional service and industries buildings/spaces.

NOTE: All rooms or spaces to be designated for smudging must be approved by National Headquarters, Facility Planning & Standards.

[3] Commissioner Directive 702, Aboriginal Offenders, 2008-12-18
Commissioner Directive 259, Exposure to Second-Hand Smoke, 2008-05-05

10.1.2 Requirements for smudging ventilation

Each room that has been designated to have smudging must have an exhaust system that exhausts directly to the exterior of the building. This will mitigate the transfer of smoke to other areas of the building.

The rooms used for smudging should be on the perimeter of the building.

10.1.2.1 Technical Requirements:

The minimum supplemental exhaust should be of 2 air changes per hour above the current changes per hour supplied by the existing mechanical ventilation system. The maximum increase should not be more than 4 air changes per hour.

This can be achieved in two ways:

- An insulated wall fan unit can be installed in the exterior of an outside wall of the room so that the unit can exhaust directly to the exterior.
- A duct system with an internal fan system that is ducted directly to the outside.

In both case the rest of the system is identical:

10.1.2.2 There should be a manual switch with a 60 minute timer.

10.1.2.3 There should be an electronic damper on the return vent(s) for the room. The switch should be set up so that when the fan is turned on the electronic damper on the return vent(s) is closed. This will mitigate the smoke from returning into the main building ventilation systems.

10.1.2.4 The supply vent(s) to the room will remain active. This does mean that the ventilation system will be slightly out of balance for a short while.

10.1.2.5 Care must be given to the placement of the exhaust vent so that it is not near operable windows, doors, ventilation intakes for any building nearby and areas. This is to mitigate the transfer of smoke to other buildings and spaces.

10.1.2.6 There is no need to weather strip the room door

10.2 Airborne isolation rooms

Airborne isolation rooms (negative pressure rooms) shall be designed as per *CSA Z317.2 -01*[4].

10.3 Other

10.3.1 Provide special ventilation systems as required for carpenters shop, paint shop, Corcan laundry room, welding shops, automotive repair areas, hobby shop etc. Design shall be to ASHRAE standards and shall be designed taking into account that users will attempt to sabotage the systems:

10.3.1.1 Under floor exhaust systems for carbon monoxide removal should be avoided as they are easily plugged and made ineffective.

10.3.1.2 Providing appropriate portable equipment may be the most suitable solution for some ventilation requirements.

[4] CAN/CSA Z317.2-01 (R2008) Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities (Includes Update No. 1 and 2)

11. ARMOURY

11.1 Environment control

11.1.1 Temperature must be controlled in the armoury within the range of 1°C to 27°C.

11.1.2 Relative humidity shall be maintained below 50% within the armoury.

11.1.3 The armoury shall be cooled during summer.

11.1.4 Make up air shall come from adjoining rooms by transfer grilles.

11.1.5 A slot exhauster type fume hood and ventilated cabinet (storage closet) shall be installed in the armoury. Solvents are used to clean the firearms, thus they shall be stored in the ventilated cabinets and used under the fume hood. Fume hood to be designed as per ACGIH standards.

11.1.6 The total evacuation air flow rate is 160 litres/second. This includes the evacuation of the fume hood, the storage closet and the evacuation of the room.

11.1.7 When beneficial, recover exhaust air with heat exchanger.

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SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations

GO AND GI PROJECTS

SECTION E – ELECTRICAL

Canada

TABLE OF CONTENTS

E-4 ELECTRICAL – INTERIOR LIGHTING & CELL LIGHTING FIXTURES

E-5 ELECTRICAL – LIGHTNING PROTECTION

E-6 ELECTRICAL - EMERGENCY ELECTRICAL

E-1 ELECTRICAL – GENERAL ELECTRICAL ENGINEERING & DISTRIBUTION SYSTEM

1. SCOPE

- This section outlines the basic electrical engineering design criteria related to the special requirements of Correctional Service Canada (CSC) and the requirements for electrical distribution.
- It applies for CSC buildings that are inside and outside the fenced institutional perimeter.
- Approval from CSC must be obtained before any variations from this document are incorporated into any designs.

2. RELATED SECTIONS

E–2 to E–6 inclusive
SP–4 – Site Lighting
SU–4 – Power Supply & Electrical Power Distribution (Comply with all clauses in this section)

3. CODES AND STANDARDS

3.1 The design for the electrical work shall:

3.1.1 Be based on and conform with the updated requirements of the applicable National, Federal, Provincial and Local Municipal Codes, Standards, Rules, Regulations and all the appropriate authorities and agencies having jurisdiction.

3.1.2 Specify applicable standards for all equipment, i.e. EEMAC, CSA, NEMA, ULC, ASTM, NFPA, ANSI, IEEE, ULI.

3.1.3 Avoid specifying trade names, when it is required, provide not less than 3 trade names and/or equivalent equal.

3.2 The last edition of the "Canadian National Master Construction Specification" format shall be used when preparing specifications.

3.3 For wiring in hazardous locations follow CSA publication "A Guide for the Design, Construction and Installation of Electrical Equipment".

4. GENERAL REQUIREMENTS

4.1 The scope of technical work shall include, but not be limited to, engineering services required for sound planning and design of all electrical work necessary for the Project including:

4.1.1 Determination of existing and site conditions.
4.1.2 Economic and feasibility studies of alternatives.
4.1.3 Services and connection to utilities.
4.1.4 Integration of design with that of other disciplines.
4.1.5 Preparation of preliminary and detailed cost estimates.
4.1.6 Preparation of Drawings and Specifications as complete Contract Documents suitable for tendering.

5. SYSTEM CONSIDERATIONS AND PRIMARY DESIGN

5.1 The guiding principles for design of electrical systems are to ensure sustainable development, reliability and LEED program.

The electrical design shall be based on the following characteristics and features:

5.1.1 Safety to personnel during operation and maintenance.

5.1.2 Flexibility of electrical services.

5.1.3 Stringent security requirements up to the level of maximum security institutions.

5.1.4 High level of vandalism and deliberate tampering with systems and equipment.

5.1.5 Availability of electrical power to critical security and life safety support systems shall exceed 99.99%; that is, less than one hour down per year. Redundancy for UPS power and air conditioning for CER and MCCP Rooms and electronics located within this room.

5.1.6 Fail safe systems and equipment of a quality consistent with anticipated building life and/or required reliability of service.

5.2 Reliability/availability studies shall be carried out for power delivery to the main communications and control post, security control posts and other areas as designated by CSC. The study shall be carried out in accordance with *IEEE Standard 493-2007*[1].

5.3 Service

5.3.1 Carry out preliminary load study and establish approximate loads at each load centre/connection point.

5.4 Voltage

5.1.1 Preferred secondary voltages and systems for internal distribution are:

- 600/347 volt wye grounded 3 phase – 4 wire
- 208/l20 volt wye grounded 3 phase – 4 wire

There may be some limited requirement to serve special loads at 120/240 volt 3 wire on 240 volt, 2 wire single phase.

5.1.2 Review voltage considerations as presented in

- *IEEE Standard 241-1990*[2] – Section 3 and
- *IEEE Standard 141-1990*[3]
- Voltage profile limits to be as presented in Figure 6 of Reference *ANSI Standard C84.1-2006*[4] – Range "A".

5.5 Metering Requirements

5.5.1 Arrange and provide revenue metering to suit utility requirements in conjunction with configuration for service/distribution.

5.5.2 Distribution configuration to provide internal energy metering upon request of the institution. Metering equipment shall be similar to that provided by the utility and shall be in accordance with *CSA Standard C17-M84 (R2008)*[5].

5.5.3 Instrument transformers for metering to be in accordance with *CAN3-C13-M83 (R2004)*[6]. Specify instantaneous indicating voltmeters and ammeters at each distribution switchboard.

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1 493-2007 – IEEE Recommended Practice for the Design of Reliable Industrial & Commercial Power Systems

2 241-1990 – IEEE Recommended Practice for Electric Power Systems in Commercial Buildings

3 141-1993 – IEEE Recommended Practice for Electric Power Distribution for Industrial Plants

4 C84.1-2006 – American National Standard for Electric Power Systems & Equipment – Voltage Ratings (60 Hz)

5 CAN3-C17-M84 (R2008) – Alternating-Current Electricity Metering

6 CAN3-C13-M83 (R2004) – Instrument Transformers

5.6 Service/Distribution System (Transformer) Configuration

5.6.1 Reliability considerations dictate that some redundant transformation is provided for large customer owned 3 phase stations since a suitable temporary spare is usually unavailable.

For smaller stations single non redundant configurations should be considered. A source for replacement spare must be established. This could mean on a project with a number of single transformer stations that a suitable spare be provided and held on the premises.

The stations must be standardized at least to the extent that the single spare may be installed at each location. Consideration should be given to installing and connecting the spare at one station in a redundant or "double ended" configuration.

Design size and configuration of systems to recognize limitations of components:

- Full load rating, interrupting capacity and withstand capability of switching, protection and control equipment.
- Short circuit capability and thermal capacity of system conductors.

5.6.2 Generally the following guidelines should be considered.

- 600 volt systems - maximum transformer size - 2500 kVA with 6.5 to 7.0% impedance to limit maximum 3 phase bolted secondary through faults to 35,000 RMS (without considering internal system sources). (3300 kVA with single stage of fan cooling on a power transformer).
- 208/120V systems - maximum transformer size - 400 kVA with 5.0 to 5.5% impedance to limit maximum 3 phase bolted secondary through faults to 20,000A RMS.
- 4160 volt systems - maximum transformer size - 4000/5333 kVA with single stage of fan cooling.

5.7 Preliminary Design Study

5.7.1 Carry out an economic study to establish optimum system configuration, voltage levels and size. Establish at least 2 and preferably 3 alternative system configurations which reasonably represent the options to consider.

- Prepare capital cost estimates for each system.
- Evaluate complete owning and operating cost estimates including
  - utility energy charges
  - losses
  - depreciation
  - cost of money
- Also carry out a quantitative analysis of the reliability of each option. Methods for this study to be set out in *IEEE Standard 493-2007*[7].
- The study to be presented in report form and should include qualitative analysis and comparisons, recognizing factors which fall outside quantitative economic reliability analysis.

[7] 493-2007 – IEEE Recommended Practice for the Design of Reliable Industrial & Commercial Power Systems

The reliability analysis should consider the system through to typical points of utilization one of which must be the critical "Emergency" power connection to the "Control Centre".

5.7.2 Based on preliminary load calculations transformer sizes and main secondary system equipment must be sized to permit 50% future expansion.

5.8 Co-ordination Study

5.8.1 Carry out preliminary co ordination study during system development.

5.8.2 Use manufacturer's typical time overcurrent characteristics for relays, fuses and circuit breaker tripping elements.

5.8.3 Specify preparation of a complete co-ordination study as part of the contract. Contractor to employ recognized independent company. Co ordination study to be submitted over stamp of a Professional Engineer, licensed to practice in a Province of Canada.

5.8.4 Co-ordination study to be submitted for approval as shop drawings.

5.8.5 Final corrected copies to be included with maintenance manuals.

5.8.6 Co-ordination studies to be carried out and presented in accordance with *IEEE Standard 242-2001*[8].

5.9 Commissioning

5.9.1 Specify preparation of a load study as part of the contract. Load study is to be reviewed and commented on by the design engineer. Study is then to be submitted to CSC.

5.9.2 Load study is to contain full load current readings of all feeders connected to 50 A circuit interrupting devices and larger. Currents are to be read at the line side of the feeders if possible.

5.9.3 Load study is to contain voltage readings taken at the load side of the feeders. Adjust transformer taps to within 2% of rated voltage of equipment.

5.9.4 Load study is to identify loads i.e. are they motors, lighting or heating.

5.9.5 Specify equipment and wiring identification as covered in Canadian National Master Construction Specification Section 26 05 00.

5.9.6 Specify balancing of loads.

5.9.7 Specify for contractor to demonstrate that systems operate as design intended them to operate and that contractors must be prepared to operate each device, such as switches, relays etc, to the satisfaction of CSC and PWC personnel involved in the acceptance procedure.

6. DISTRIBUTION EQUIPMENT

6.1 General Requirements

6.1.1 Copper bus bars for all distribution equipment.

6.1.2 Main electrical and telecom rooms should be built above 200-year flood plains.

6.1.3 Apply ground fault protection as per Canadian Electrical Code.

6.2 Switchgear Assemblies

Refer to and specify in accordance with *CSA Standard C22.2 No. 31-04 (R2009)*[9]. Also refer to and specify as "*Metal Enclosed Low Voltage Power Circuit Breaker Switchgear*" in accordance with *EEMAC G8-2, 1972*[10] (section from page 48 to page 55).

[8] 242-2001 – IEEE Recommended Practice for Protection and Commercial Power Systems

6.3 Distribution Switchboards

Refer to and specify in accordance with *CSA Standard C22.2 No. 31-04 (R2009)*[11]. Also refer to *ANSI/IEEE Standard 241-1990* [12] under *"Metal Enclosed Distribution Switchboards"* and to *NEMA PB 2-2006* [13].

6.4 Unit Substations

Refer and specify in accordance with:

- *EEMAC G13.1, 1978*[14]
- *ANSI/IEEE C37.121-1989*[15]
- Refer to Section SU-5.

6.5 Feeder Switch Units (Fusible)

Refer to and specify heavy duty classified switch units in accordance with:

- *NEMA KS 1-2001 (R2006)*[16], and
- *CAN/CSA-C22.2 No. 4-04 (R2009)*[17]

Units shall be horsepower rated for overload current interrupting capability.

6.6 Fuses for Feeder Switch Units

Select and specify a suitable time delay J type fuse (not covered under referenced standard) and apply for transformer primary protection where required.

6.7 Moulded Case Circuit Breakers

6.7.1 *CSA Standard C22.2 No. 5-09*[18].

6.7.2 The use of solid state trip units for moulded case breakers at the distribution level is encouraged to allow for best protection coordination

6.8 Panel boards

6.8.1 Refer to and specify in accordance with *CSA C22.2 No. 29-M1989 (R2009)*[19].
A considerable number of spare breakers and spaces are required.

6.8.2 For panel boards supplying appliance loads to cells, specify contactor, electrically held in mains with 120V 600Hz coil for remote control (3 wire) from central control station.

6.8.3 Panels with GFP to be installed as close as practical to the outlets served.
NOTE: All appliance receptacle circuits to cells supplied from GFP breakers.

6.9 Busways

6.9.1 Refer to and specify in accordance with *CSA C22.2 No. 27-09*[20].

6.9.2 Where practical specify for feeders 1000A and larger, and where run between switchboards within equipment rooms and in service corridors:

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9 C22.2 No.31-04 (R2009) – Switchgear assemblies
10 EEMAC G8-2, 1972 – EEMAC Standard for Switchgear Assemblies
11 C22.2 No.31-04 (R2009) – Switchgear assemblies
12 241-1990 – IEEE Recommended Practice for Electric Power Systems in Commercial Buildings
13 NEMA PB 2-2006 – Deadfront Distribution Switchboards
14 EEMAC G13-1, 1978 – EEMAC Standard for Unit Substations
15 ANSI/IEEE C37.121-1989 – American National Standard for Switchgear – Unit Substations – Requirements (NEMA 210.1970(R1976) – Secondary Unit Substations has been withdrawn no direct replacement.)
16 NEMA KS 1-2001 (R2006) – Enclosed and Miscellaneous Distribution Equipment Switches (600 V max.)
17 CAN/CSA-C22.2 No. 4-04 (R2009) – Enclosed and Dead-Front Switches
18 C22.2 No. 5-09 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
19 C22.2 No. 29-M1989 (R2009) – Panelboards and Enclosed Panelboards
20 CSA C22.2 No. 27-09 – Busways

- for feeder specify low impedance type, open ventilated with insulated bus bars and joints.
- specify copper bus bars.
- specify bracing for available fault current.
- specify neutral if required.

6.9.3 Where feasible - in manufacturing areas, in accordance with accepted industrial practice, specify plug in bus duct, totally enclosed type.
Plug in units with circuit breaker for branch power circuit protection.
Size Ranges: 100A and 225A.

6.9.4 3 phase 4 wire bus duct to have full size neutral.

6.10 Step down Transformers

Refer to and specify dry type transformers in accordance with *CSA C9-02 (R2007)*[21].

6.11 Grounding Systems

6.11.1 When designing grounding systems for Electrical Distribution refer to and comply with the following standards:

- *CSA Standard C22.1-09*[22]
- *ANSI/IEEE Standard 142-2007*[23]

6.11.2 Design is to ensure that grounding system ground resistance suits the needs of the most sensitive equipment even if this exceeds by far the CSA Standard (50 ohms).

7. WIRING

7.1 Methods

7.1.1 For feeders, 1000A and larger which run in

- main electrical rooms
- main power plant

Specify - bus duct.

7.1.2 For feeders 1000A and less, emergency feeders, branch circuits, control circuits, alarm circuits and any other kind of feeders and/or circuits; Specify copper conductors and shall conform with the applicable Codes, Standards, Rules, Regulations and all the appropriate authorities having jurisdiction.

7.1.3 Specify flexible steel conduit for final connections to motors of all equipment subject to vibration.

7.1.4 Specify liquid tight flexible steel conduit where conditions of installation, operation or maintenance require flexibility and protection from liquids, vapours or solids.

7.1.5 Specify minimum conduit size for light and power branch circuits to be 20 mm.

7.1.6 In armouries and wherever solvents are used, specify explosion proof installations. (Refer to Section A-13 Armoury)

7.2 Conduit Raceway

7.2.1 Specify conduit raceway in accordance with applicable CSA Standard.

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21 CSA C9-02 (R2007) – Dry-Type Transformers

22 C22.1-09 – Canadian electrical code, part I (21st ed.), safety standard for electrical installations

23 142-2007 – IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems

- *C22.2 No. 45.2-08*[24]
- *C22.2 No. 56-04 (R2009)*[25]
- *C22.2 No. 83.1-07*[26]
- *C22.2 No. 211.2-06*[27]

7.2.2 The electrical designer is to request in writing to the Project Manager that he, the designer, is given in time all the necessary information on all the empty conduit and raceway systems required for other systems such as alarms and telephones etc. so that these conduits can be included in the electrical design before the electrical tender call.

7.3 Conductors

7.3.1 Specify all conductors to be of copper.

7.3.2 Insulation is to be of the thermosetting type XLPE, Rated RW90.
Conductors are to be manufactured and tested in accordance with *CSA C22.2 No. 38-05*[28]. Specify RWU90 type if in conduit raceway in or below slab or in perimeter wall when in contact with earth or backfill materials.

7.3.3 Minimum conductor sizes for lighting and appliance circuits to be copper AWG #12.

7.3.4 For feeders specify compression lugs wherever possible.

7.3.5 For feeders and branch wiring specify colour coding of conductors for phases, neutral and ground.

7.4 Wiring Design

7.4.1 Design interior distribution system so that branch circuits are concentrated at the panelboards and the circuits so connected that the loads on each side of the system will balance within three percent with all the lamps burning.

7.4.2 Specify that Contractor, in providing this installation balances all loads as evenly as possible on all phases at each panel.

7.4.3 Special requirements - for cells:

- Separate lighting circuits for cells.
- Institutions for men; separate receptacle circuit (120V) for each cell. Receptacle circuits in cells supplied with 15 Amp breakers ground fault circuit interrupter type GFCI at panel, separate neutral required.
- Institutions for women; separate receptacle circuit (120V) for each cell. Receptacle circuits in cells supplied with 20 Amp breakers ground fault circuit interrupter type GFCI at panel, separate neutral required.
- Arc Fault Circuit Interrupter AFCI is considered a non code requirement for cells.

7.5 Underfloor Duct System

Base design of an underfloor distribution system, specify in accordance with *CSA C22.2 No.80-1978 (R2008)*[29] and *CEMA F 4-1, 1970*[30].

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24 C22.2 No. 45.2-08 – Electrical rigid metal conduit – Aluminium, red brass, and stainless steel
25 C22.2 No. 56-04 (R2009) – Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
26 C22.2 No. 83.1-07 – Electrical Metallic Tubing – Steel
27 C22.2 No. 211.2-06 – Rigid PVC (Unplasticized) Conduit
28 CAN/CSA-C22.2 No. 38-05 – Thermoset-Insulated Wires and Cables
29 CSA C22.2 No.80-1978 (R2008) – Underfloor Raceways and Fittings
30 F4-1, 1970 – CEMA Standard For Underfloor Distribution System

8. ELECTRIC HEATING

8.1 General

8.1.1 In areas where hot water heating is not feasible or such heating is unavailable, electric heaters should be considered.

8.1.2 Specify heaters to be controlled by either remote wall mounted room thermostats or built in thermostats. Thermostats should be used singly or in combination to control several heaters up to the permissible thermostat ampere rating. Where required, appropriate contactors should be specified.

8.1.3 All thermostats should be programmable line voltage with modulating output.

8.2 Electric Heaters for Pipe Tracing

Where electric heater cables are to be used for protecting piping from freezing, only heaters of the required length and capacity should be specified.

8.3 Heater Units

Specify heater units consisting of a heating section of specified length, joined to a cold section of required length to connect to junction boxes located to suit the particular conditions.

8.4 Heating Sections

Specify heating sections to be of two or three conductor copper alloy resistance wire, insulated with compressed magnesium oxide, and covered by an annealed seamless copper sheath. Cold section should consist of two or three conductor mineral insulated copper sheathed power cable with a current carrying capacity in accordance with the Canadian Electrical Code.

8.5 Thermostats

Specify that heater circuits be controlled by thermostat(s) with temperature range of 0°C to 40°C housed in NEMA 4 cast aluminium enclosure.

E-2 ELECTRICAL – WIRING DEVICE

1. SCOPE

This section outlines the requirements and characteristics of wiring devices.

2. RELATED SECTIONS

SP–4 – Site Lighting
E–1 and E-3 to E–6 inclusive

3. LOCAL SWITCHES

3.1 Local switches are to be rated 15 A at 125 V with fully enclosed composition cases, and rated 20 Amperes at 250 V for control of fluorescent lighting loads exceeding 500 W. Specify mounting 1370 mm centre from finished floor.

3.2 Specify three tamper resistant receptacles in living unit cells and administrative segregation cells.

3.3 Switching of Cell Lights and receptacles can be combined onto a single touch screen that is combined with door control, P/A, and Cell Call Systems.

3.4 Specify a master control to cut power to all cell receptacles in each living unit etc. This could be achieved by use of main breaker in cell receptacle panel.

4. CONVENIENCE RECEPTACLES

Duplex receptacles *NEMA Standard 5-20R*[1] U ground - rated 20 A at 125 V with double wiping contacts. Specification grade. Specify mounting at 300 mm centre from finished floor, unless otherwise directed by User. Cell and segregation receptacles to be tamper resistant.

5. POWER AND SPECIAL PURPOSE RECEPTACLES

5.1 Specify all receptacle in accordance with *CSA C22.2 No. 42-99 (R2009)*[2] and related NEMA *Standards WD 1-1999 (R2005)*[3], and *WD 6-2002 (R2008)*[4].

5.2 Power and special purpose receptacles of ratings and configurations compatible with usage in shops, laboratories, etc. Specify a minimum of one receptacle 30A, voltages that are available on site (208, 240 or 347V) per laboratory.

6. G.F.C.I.

Provide G.F.C.I. breaker on all circuits supplying receptacles in cells and any other locations required by code.

7. COVER PLATES

7.1 Specify device plates for switches and receptacles for single and multigang application. Stainless steel, satin finish on flush mounted outlet boxes, and galvanized pressed steel surface covers on surface mounted outlet boxes. Plates for weatherproof receptacles gasketed with spring loaded lift covers. Corrosive resistant where corrosive materials may be used. Bushed openings where required in laboratories. Specify that finishes on

1 Receptacles design: ANSI/NEMA WD 6-2002 (R2008) – Wiring Devices—Dimensional Specifications
2 C22.2 No. 42-99 (R2009) – General Use Receptacles, Attachment Plugs, and Similar Wiring Devices
3 NEMA WD 1-1999 (R2005) – General Color Requirements for Wiring Devices
4 ANSI/NEMA WD 6-2002 (R2008) – Wiring Devices-Dimensional Specifications, WD 5-1977 has been withdrawn with no clear replacement

electrical equipment, cover plates and surface mounted outlet boxes match the finishes on mechanical fittings. Specify all receptacle cover plates be identified to the panel and breaker for that circuit.

7.2 For devices in cells, specify cover plates with "Security Screws" or have special boxes and cover plates fabricated. Refer to detail included herewith.

8. OUTLET BOXES

Galvanized steel outlet boxes, 4 inch square minimum and oversized where number of conductors exceed standard size. Open back concrete type where cast in slab. Cast iron fittings where exposed and appropriate supports for secure fastening.

9. MULTIOUTLET SYSTEMS

In laboratories and certain shops consider the use of multioutlet systems of the following types and characteristics:

9.1 Surface mounted all steel raceways for use with number and type of wiring devices required.

9.2 System of raceway with snap on cover containing brackets for mounting of grounding type wiring devices located and rated as required and having the capability of being installed wherever desired within the raceway.

9.3 Alternate system of raceway with snap on cover containing prewired coils with 15A, 125V grounding type receptacles spaced in groups of two(2), on 1500 mm centers, or as directed by User (providing a duplex receptacle at each location).

9.4 Device plates finished to match that of multioutlet system raceway. Each receptacle cover indent stamped with the voltage and ampere rating of that receptacle. Receptacles fed from an emergency source should be of the illuminated face type with integral neon glow lamp.

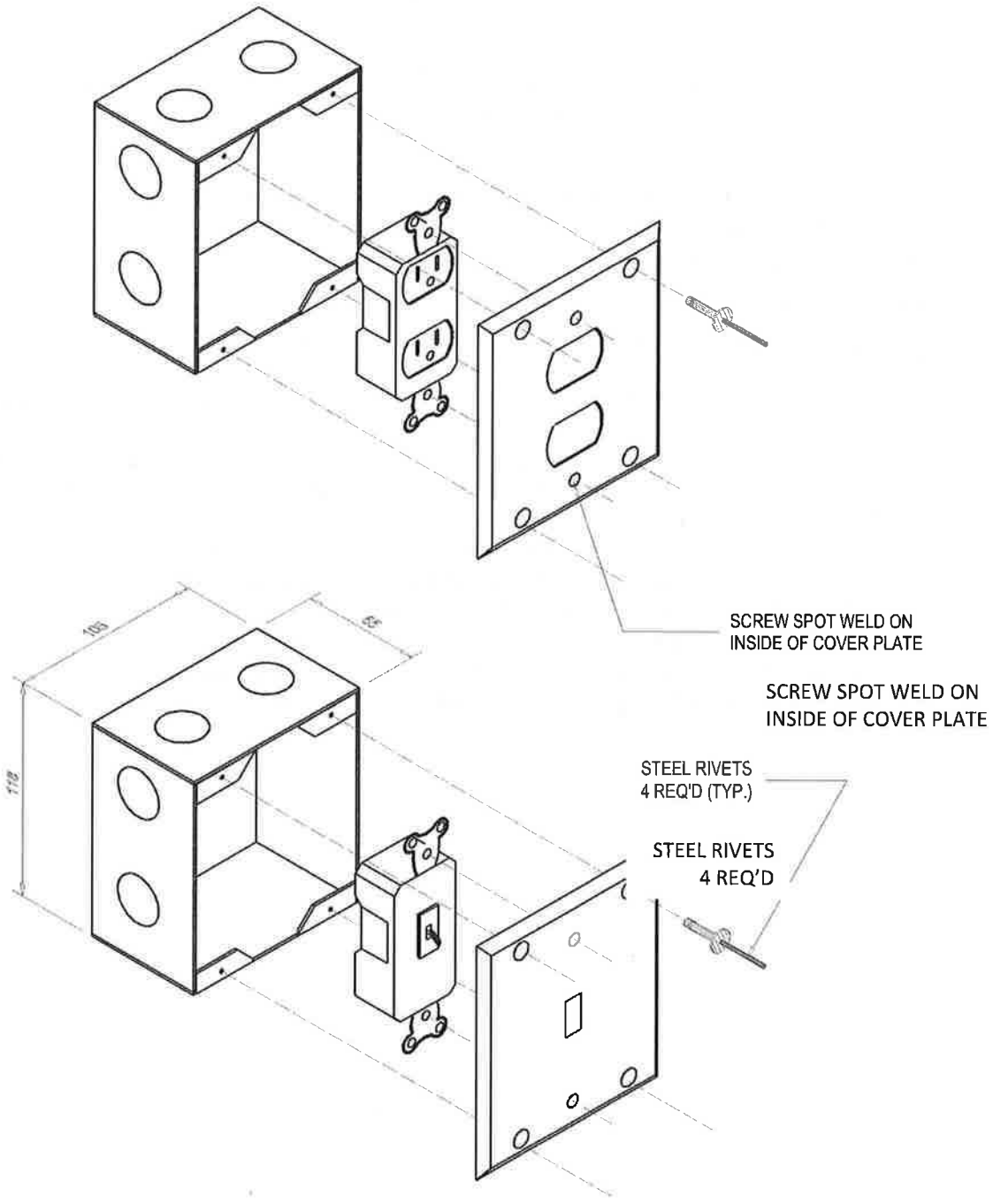

PLATE E–2–1 – FASTENING OF CELL WIRING DEVICES USING POP RIVETS

E-3 ELECTRICAL – MOTOR CONTROLS

1. SCOPE

This section outlines the characteristics and features of motor controls and auxiliary control components and provides design guidelines for these components.

2. RELATED SECTIONS

E–1 – General Electrical Engineering
E–2 – Wiring Devices

3. MOTOR CONTROLS

3.1 General

Consider and specify the following characteristics and features for motor controls and auxiliary control components to obtain the performance intended.

3.1.1 Motor controls to conform to UL Standard 508[1].

3.1.2 Sequential starting of large motors connected to emergency generator.

3.1.3 Provide for an overload heater in every phase.

3.1.4 Draw to the attention of the mechanical designer to call for factory installed thermistors, one in each phase, wired to identify terminals in the motor terminal box. This thermal protection shall be provided for all motors above 25 HP. The motor starters must also be specified to include the required controls.

3.2 Magnetic Starters

3.2.1 Combination magnetic motor starters shall be provided for all 3 phase motors.

3.2.2 Combination magnetic starters requiring motor circuit protection shall be equipped with circuit breaker type or "Motor Circuit Protector" with integral current limiting fuses where required for available short circuit: Multipole opening on blown fuses.

3.2.3 Combination magnetic starters not requiring motor circuit protection shall be equipped with horsepower rated unfused switch. Switch to comply with applicable sections of *CSA C22.2 No. 4-04 (R2009)*[2].

3.2.4 Combination magnetic starters shall have low voltage protection type control circuit, with momentary contact type manual control. Where auto restart is required provide timing relay adjustable pickup to ensure stable voltage on application (return) of power. Applicable for motor sizes 5 HP and larger.

3.2.5 Manual automatic control with HOA selector switch, LED pilot light and low voltage release shall be provided for motors below 5 HP. Positive indication using LED pilot lights shall be provided for motors with local disconnect switches.

3.2.6 Black sandwich type laminated plastic nameplates with white letters indicating function and association shall be provided for all magnetic starters.

3.3 Manual Type Motor Starters

For manual type motor starters specify toggle switches with thermal overload protection and LED pilot light.

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1 UL 508 -- Industrial Control Equipment, Edition: 17th, Underwriters Laboratories / 28-Jan-1999 / 208 pages

2 CAN/CSA-C22.2 No. 4-04 (R2009) -- Enclosed and Dead-Front Switches

3.4 Reduced Voltage Starters

3.4.1 Verify whether the voltage drop due to motor starting is within limits acceptable to the local Power Authority. Also consider motor starting transient voltage effect on other building systems, motor circuit, distribution system protection device and sensitive electronic equipment.

3.4.2 Determine, according to application, the most appropriate method of limiting the starting inrush current and specify the type of reduced voltage starter to satisfy the starting requirements of the load. Consider star delta, auto transformer, part winding and primary resistor starter types depending on the specific application requirements. All starting sequences shall be of the closed transition type.

3.4.3 Specify motor starter with soft start on motor > 5 HP or where reduced starting torque will reduce maintenance and energy requirement significantly.

4. MOTOR CONTROL CENTRES

Motor control centres shall include:

4.1 Multiple vertical sections with main horizontal and vertical copper buses.

4.2 Ground bus copper, minimum 25% of main bus.

4.3 Main disconnect device, heavy duty load break, or non auto air circuit breaker.

4.4 Individual combination (fuses, unfused or circuit breaker) controllers of required NEMA size, mechanically interlocked to prevent opening door when in ON position except through release mechanism, and suitable for padlocking. Equipped with appropriate push buttons, selector switches, pilot lights, reset buttons. Other applicable features as described for individually mounted motor starters, manual and magnetic types.

4.5 Auxiliary relays for automatic operation.

4.6 Wiring compartments for copper conductors, power and control wiring.

4.7 Black sandwich type laminated plastic nameplates with white letters identifying each circuit.

4.8 Use Class II C for motor control requiring interlocks or extensive automatic sequenced pilot control for industrial process or building systems.
Use Class 1B for stand alone or single automatic pilot control.

4.9 Specify primary and secondary fuses for all control transformers in motor control centres.

4.10 Bus supports: With high dielectric strength, low moisture absorption, high impact material and long creepage surface signed to discourage collection of dust.

4.11 Refer also to *EEMAC Standard E14-2, 1983*[3].

5. CONTROL SEQUENCES

Specify that Contractor co ordinate all work with respect to motors controlled by individual starters or/and from motor control centers and all control sequences.

[3] EEMAC E14-2, 1983 -- EEMAC Standard for Industrial Control and Systems

6. DISCONNECT SWITCHES

6.1 Specify horsepower rated disconnect switches, fused or unfused, mounted adjacent to all motors regardless of their location with respect to the motor circuit branch circuit breaker.

6.2 Disconnect switches shall comply with *CSA C22.2 No. 4-04 (R2009)*[4].

7. WIRING

7.1 Power wiring shall be in accordance with Section E-1 Electrical Distribution.

7.2 Specify stranded tinned copper for control wiring. All terminations shall be on terminals or terminal blocks. All control wiring shall be colour coded.
Wherever practical specify multi conductor cable assemblies; conductors with 600 V insulation; minimum size 2 mm^2 overall PVC jacket.

7.3 Control wiring shall be terminated with compression type terminals.

7.4 Control wiring method shall generally be conductors (cable assembly) in electric metallic tubing.

[4] CAN/CSA-C22.2 No. 4-04 (R2009) Enclosed and Dead-Front Switches

E-4 ELECTRICAL – INTERIOR LIGHTING & CELL LIGHTING FIXTURES

1. SCOPE

This section outlines the requirements for interior lighting and provides design criteria for the following:

1.1 Quality and quantity of illumination for specific visual tasks, movements and exits.

1.2 Interior lighting fixtures.

1.3 Cell lighting fixtures.

2. RELATED SECTIONS

E–1 – General Electrical Engineering
E–2 – Wiring Devices
E–6 – Emergency Electrical

3. CODES AND STANDARDS

Design the interior lighting in accordance with the following Codes and Standards and applicable local regulations:

3.1 National Building Code -- Latest Edition

The requirements of the National Building Code have been included in this Document. Wherever local regulations differ from the Code and this Document, the most stringent conditions shall apply.

3.2 ANSI/IESNA RP-1-04[1].

3.3 I.E.S. Handbook

The latest edition of the Illuminating Engineering Society Handbook[2] contains detailed information on light sources and lighting for all types of applications.

4. ELEMENTS OF ILLUMINATION

4.1 General requirement

Design the lighting system to provide the levels of illumination in accordance with Latest Edition of IESNA. Consideration should be given to environment, green initiative and rapid changes due to new technology. Select lighting fixtures of the quality and characteristics to achieve and maintain the following criteria.

4.2 Glare Control

Keep direct glare and reflected glare to a minimum.

4.3 Brightness Pattern of Environment

Design lighting system to conform to the following visual criteria:

4.3.1 Ensure that the task is visible by being brighter than its immediate background
4.3.2 Control other brightness within the office environment and reflectance of interior finish.

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1 ANSI/IESNA RP-1-04 -- American National Standard Practice for Office Lighting (CSA C92.4-1977 has been withdrawn, CSA has adopted the ANSI equivalent)

2 IESNA -- Lighting Handbook on CD-ROM, 9th edition, 10th edition → late 2010

4.4 Colour

The colour of the illuminant (light) is an important facet of the lighting quality and has a direct effect on the people and furnishings within an office environment. Therefore, the following aspects shall be considered in selecting light sources (lamps):

4.4.1 In offices, administrative areas, maintenance and service areas specify 32W, rapid start (RS) fluorescent cool white lamps which offer a more efficient, moderately cool source of illumination.

4.4.2 In areas where people congregate for discussion, e.g., conference rooms, cafeterias, etc. specify good colour rendering 32W rapid start, deluxe cool white fluorescent lamps which offer a warmer atmosphere.

4.4.3 LED and induction lamps may be specified as necessary to achieve the desired illumination levels and effects.

4.4.4 Confer with Architect and draw to his attention the following considerations affecting general visual comfort:

4.4.4.1 Light colours are preferred for interior furnishings and dark colours should only be used in small areas as contrasts to the colours of the major areas.

4.4.4.2 Selection of colours of walls, floors, furniture and furnishings should be made in accordance with the Technical Criteria Section A-7 "Finishes".

4.5 Office Lighting Layout

In laying out the office lighting systems, consider the fact that most office spaces undergo rearrangement. This need for rearrangement requires that the lighting system be flexible and suitable for partitions to be erected between rows of luminaires and individual units. Modular co-ordinated systems are suited to the solution of this problem and should be studied for possible incorporation into the design.

4.6 Supplementary Lighting

4.6.1 Design supplementary or local (task) lighting in the form of units attached to the ceiling or building structure for limited areas that require higher levels of illumination.

4.6.2 Design lighting so as to avoid and discourage the use of portable desk lights, table lamps, swag lamps, etc.

4.7 Video Display Units

4.7.1 Consider indirect lighting systems.

4.7.2 Arrange lighting fixtures to eliminate source brightness contrast on video screens. Employ low brightness louvers with minimum 45° shielding angle.

4.7.3 Consider reduced task lighting levels in order to eliminate brightness contrast.

4.7.4 Provide 500 lx on task surface where source documents must be read.

4.8 Control Posts and Ranges

In ranges and related control post areas, design corridor lighting to eliminate glare and source brightness in field of view from control post. Take note of glass/plastic and other highly reflective surfaces and ensure against mirrored light source images within control post field of view. Refer to Technical Criteria Section A-13 regarding glare control in

control posts. Include dimmer controls for general lighting in control posts. Make provision for Task Lighting.

5. LIGHTING FOR MOVEMENTS AND EXITS

In designing lighting systems for areas of circulation, means of egress and means of vertical transportation, consider the following factors:

5.1 Public Entrance Lobbies

5.1.1 Design lighting to facilitate movement throughout the area without being garish or creating glare and discomfort.

5.1.2 Where canopies extend outside the entrances, specify lighting which is not subject to fluctuation on light output due to high winds or low temperatures.

5.1.3 Specify low temperature ballasts (-40°C) in all fixtures located outdoors.

5.1.4 Totally enclosed and gasketed fixtures should be specified for outdoor applications only.

5.1 Corridors and Hallways

5.1.1 The spacing of lighting equipment from centre to centre should not exceed 1½ times the mounting height.

5.1.2 The level of illumination shall be between 20% and 30% of adjacent areas but not less than 215 lx minimum. Where security viewing is involved the minimum shall be 325 lx.

5.1.3 Reflectance for ceilings, walls and floors shall equal or exceed those recommended for the offices. Draw to the Architect's attention the fact that if, for maintenance reasons, dark finishes must be used, they should be limited to the baseboard.

5.1.4 Changes in elevation in corridors where one or two steps are necessary shall have attention drawn to the change by locating small shielded lighting units recessed into the walls at the steps or by painting the edges of the steps in a distinctive colour.

5.2 Stairways

5.2.1 Locate and shield lighting equipment so that persons neither cast shadows on the stairs nor encounter glare at eye level.

5.2.2 Locate units at least on every landing and closer if necessary.

5.2.3 Specify battery operated Lighting Units in all stairways and exit corridors as emergency lighting backup.

5.3 Elevators

5.3.1 Design adequate lighting at the threshold to call attention to any difference in level between the landing and the car.

5.3.2 Draw the Architect's attention to the fact that the interior finish off the car should be as light as possible, consistent with reasonable ease of maintenance.

5.4 Exits

5.4.1 All exit doors and passageways other than the exits serving as the main entrance to a room or building shall have exit signs placed over them as described in paragraphs 5.4.3, 5.4.4 and 5.4.5, and as required by the National Building

Code, Subsection 3.4.5[3]. These signs shall be LED lighting and illuminated continuously while the building is occupied and be connected to a separate emergency lighting circuit.

5.4.2 Exits and paths of exit travel are to be indicated by electrically illuminated bilingual exit signs. Size of lettering to meet the National Building Code and the requirements of the local Fire Department.

5.4.3 Illuminated exit signs are to be provided in stairwells at points of egress to outdoors and/or to corridors leading to exits.

5.4.4 Specify additional sockets and lamps in each EXIT sign fixture to be connected to a battery system. If there is no provision for a standby generator, specify self contained battery powered exit lights.

5.4.5 All exit doors leading to the outside of buildings shall have lighting fixtures above the exits, on the outside of the building.

6. LIGHTING FIXTURES

6.1 General Requirements

In specifying lighting fixtures follow the following general criteria:

6.1.1 Fluorescent fixtures utilizing low brightness pure virgin acrylic lenses and LED lamps are preferred.

6.1.2 Minimize the use of incandescent fixtures and maximise the use of LED.

6.1.3 Where more than 100 fixtures are used, specify that the Contractor submit a sample fixture for approval, if requested by the Engineer. Select the sample at random from those delivered on site for approval of all fixtures for installation.

6.1.4 Specify that the Contractor submit complete photometric data, based on the actual fixtures proposed to be furnished for the Project.

6.2 Fixture Construction

The following features should be considered:

6.2.1 Free of light leaks

6.2.2 Ventilation for lamps and ballasts

6.2.3 No crossbars over light shields.

6.2.4 Weatherproof enamel finish, including hangers for weatherproof and vapour tight fixtures.

6.2.5 Fluorescent fixtures to be suitable for operating with specified ballasts without tripping under conditions of maximum 10% voltage above and below nominal.

6.2.6 Maximum 38°C ceiling cavity ambient for recess mounted units.

6.2.7 Maximum 38°C surrounding air ambient for pendant mounted units.

6.2.8 Maximum 27°C surrounding air ambient for surface mounted units.

6.2.9 Aluminium to concrete contact surfaces with coating of polyurethane base paint.

6.2.10 Minimum 20 gauge sheet steel for fluorescent fixture housings.

6.2.11 Interior reflecting surfaces of fluorescent fixtures finished with polymerized baked white coating to achieve a reflectance of at least 85%.

6.2.12 Exterior surfaces of fluorescent fixtures finished with basked white enamel.

6.2.13 Bonderized and painted after fabrication.

[3] National Building Code of Canada, Volume 2, Thirteenth Edition, 2010, National Research Council Canada

6.3 Ballasts

6.3.1 For fluorescent fixtures specify ballast of the following characteristics, meeting *ANSI C82.1-2004*[4] and *CSA C22.2 No. 74-96 (R2005)*[5]:

6.3.1.1 Instant start, electronic ballasts with 20% THD or less are preferred.

6.3.1.2 Internal non resetting thermal protector for core and coil and non resetting, end of life protector for capacitor.

6.3.1.3 Low NEMA rated noise level.

6.3.1.4 Energy efficient, high power factor, having long life and low operating temperature.

6.3.2 HID's ballasts to meet or exceed the performance requirements to *ANSI C82.4-2002*[6]. Ballast to be of constant wattage and have isolated secondary.

6.4 Lamps

6.4.1 Fluorescent: Energy efficient type; 32 Watt, T8 lamp, 5000 K, high CRI.

6.4.2 LED lamps, Induction lamps, HPS and LPS lamps.

7. CELL LIGHTING FIXTURES

7.1 Fixture Type

Cell light fixtures may be supplied by CSC at a cost per unit to the Contractor. The fixture will be manufactured for CSC. Specify storing, installing etc. by Contractor, unless instructed by CSC otherwise.

7.2 Power Requirement

The fixture shall include a 2/32 W fluorescent lamp rapid start ballast. It shall operate on 120 VAC 60Hz on a separate circuit than receptacles. It will also have a small lamp as night light. LED strip lighting may be used instead of fluorescent.

7.3 Installation

Specify installation of fixture to suit the dimensions given in "Plate E-4-1" at end of this section.

7.4 Use

Specify use of this fixture for all medium, maximum, and multi security institutions. The fixture is to be used in all cells and similar inmate secure areas.

8. LEVELS OF ILLUMINATION

8.1 General

8.1.1 Lighting levels should be in accordance with Illuminating Engineering Society Handbook, Latest Edition – IESNA. Submit to CSC detail calculations of light intensities to support the design.

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4 C82.1-2004 – American National Standard for Lamp Ballasts—Line Frequency Fluorescent Lamp Ballasts

5 CAN/CSA-C22.2 No. 74-96 (R2005) – Equipment for Use with Electric Discharge Lamps

6 C82.4-2002 – American National Standard for Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type)

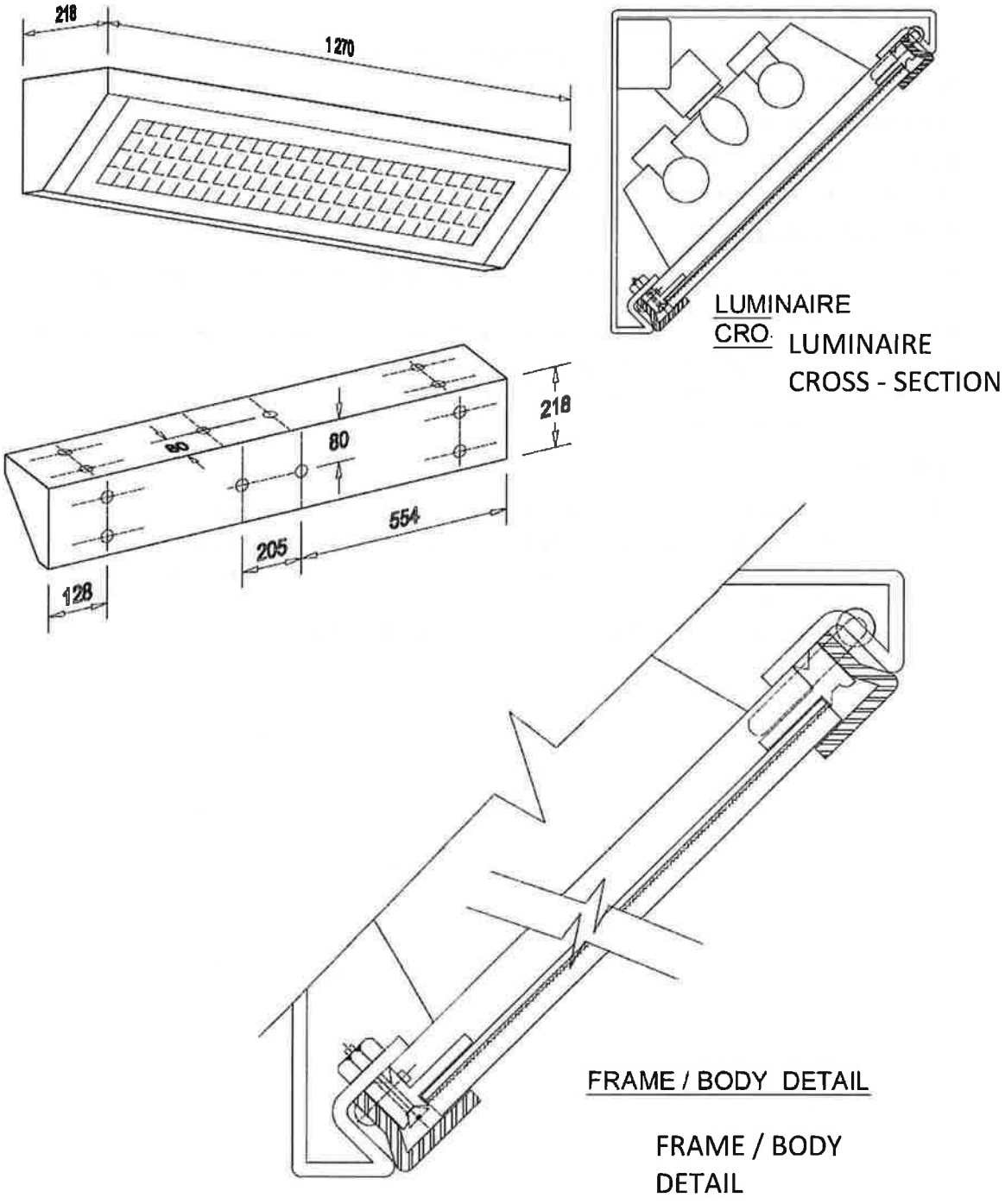

PLATE E–4–1 – CELL LIGHTING FIXTURES

E-5 ELECTRICAL – LIGHTNING PROTECTION

1. SCOPE

This section outlines guidelines for determining the need for lightning protection and for the design and specification of an appropriate system.

2. RELATED SECTIONS

SU–4 – Power Supply and Electrical Power Distribution
E–1 – General Electrical Engineering & Electrical Distribution

3. CODES AND STANDARDS

3.1 The standard for design of the protection system described herein is *CSA B72-M87 (R2008)*[1].

3.2 Approval, inspections and testing by Authorities having jurisdiction must be obtained.

3.3 Other applicable codes and standards:

- *Canadian Electrical Code, Part I CSA C22.1-09*[2].
- Canadian Labour Code, Part IV.

4. GROUNDING

4.1 Special attention must be paid to obtain good grounds. The Installation Code calls for a ground resistance of 50 ohms or less. This may suffice for general building structures, for protection of communication and alarm systems the ground resistance may have to be much lower.

4.2 For information refer to *ANSI/IEEE 142-2007*[3] and *IEEE 487-2007*[4].

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1 CAN/CSA-B72-M87 (R2008) – Installation Code for Lightning Protection Systems
2 C22.1-09 – Canadian electrical code, part I (21st ed.), safety standard for electrical installations
3 142-2007 – IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems
4 487-2007 – IEEE Recommended Practice for the Protection of Wire-Line Communication Facilities Serving Electric Supply Locations

E-6 ELECTRICAL - EMERGENCY ELECTRICAL

1. SCOPE

This section outlines the emergency power requirements with regard to light and power provisions and essential generating equipment.

2. RELATED SECTIONS

SU–4 – Power Supply and Electrical Power Distribution
E–1 to E–6 inclusive

3. ADDITIONAL REFERENCES

3.1 The following standards (including latest revisions) and texts should be referenced when designing emergency electrical installations:

3.1.1 *CSA Standard C282-09*[5]
3.1.2 *CSA Standard Z32-09*[6]
3.1.3 *EEMAC Standard M1-6, 1986*[7] (See related Standard Ref. 5)
3.1.4 *NEMA Standard MG 1-2009*[8]
3.1.5 Beeman D – McGraw Hill Systems Publications – Industrial Power Handbook
3.1.6 *IEEE Standard 446-1995*[9]
3.1.7 *CSA Standard C22.2 No. 178.1-07*[10]
3.1.8 *CSA Standard C22.2 No. 178.2-04 (R2009)*[11]
3.1.9 Fire Commissioner of Canada - FCC No. 501 Standard for Emergency Lighting Services

4. REQUIREMENTS FOR MINIMUM SECURITY LEVEL INSTITUTIONS

4.1 Standby power may be considered for minimum security level Institutions

4.2 Consider battery powered backup for use in critical areas. Same requirement for medium security level may be applied.

5. REQUIREMENTS FOR MEDIUM SECURITY LEVEL INSTITUTIONS

5.1 General Requirements

Standby power is a requirement for medium security level institutions. Requirements can be broken down into three categories as follows:

5.1.1 Total Standby power is required as follows:

5.1.1.1 Cells and Living units all lighting and receptacles.
5.1.1.2 Kitchen and dining areas; Kitchen equipment, lighting, refrigerators, freezers and walk in coolers
5.1.1.3 Medical Centre and maintenance building

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5 CSA Standard C282-09 – Emergency electrical power supply for buildings.
6 CSA Standard Z32-09 – Electrical safety and essential electrical systems in health care facilities.
7 EEMAC M1-6, 1986 – EEMAC Standard for Motors and Generators
8 NEMA Standard MG 1-2009 – Motors and Generators
9 IEEE Standard 446-1995 – IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications
10 CSA Standard C22.2 No. 178.1-07 – Requirements for Transfer Switches
11 CSA Standard C22.2 No. 178.2-04 (R2009) – Requirements for Manually Operated Generator Transfer Panels

5.1.1.4 Segregation
5.1.1.5 Control Posts and UPS equipment.
5.1.1.6 All systems and devices such as: telephone, intercommunication, fire alarm, riot alarm, door control and alarm, P.A. etc.
5.1.1.7 Outdoor security lighting
5.1.1.8 Equipment and alarms associated with the site water supply
5.1.1.9 Sump pumps, fire pumps, chillers and associated alarms
5.1.1.10 All night lights and battery operated lights
5.1.1.11 Several convenience outlets throughout complex
5.1.1.12 Power to provide full heating and ventilation for control posts, medical centre, kitchen and dining rooms and to provide partial heating to prevent freezing in other areas.

5.1.2 No Standby power (except for night lights) for:
5.1.2.1 Industrial shops
5.1.2.2 Vocational shops
5.1.2.3 Meeting rooms
5.1.2.4 Academic rooms
5.1.2.5 Library
5.1.2.6 Chapel
5.1.2.7 Outdoor recreation areas.

5.1.3 Partial standby power for:
5.1.3.1 Administration offices (25% lighting)
5.1.3.2 Indoor recreation areas (50% lighting).

5.2 Battery Backup

Refer to Article 7. Battery Backup this section.

5.3 Emergency Lighting

Refer to Article 8. Emergency Lighting this section.

6. REQUIREMENTS FOR MAXIMUM AND MULTI SECURITY LEVEL INSTITUTIONS

6.1 General Requirements

Requirements apply also to Regional Reception Centres, Regional Mental, Psychiatric Centres and Special Handling Units.
Standby power is required for the entire complex of maximum and multi Security level Institutions with the following exceptions:

6.1.1 No standby power for:
6.1.1.1 Outdoor recreation areas
6.1.1.2 Industrial shops equipment

6.1.2 Partial standby power for 50% reduced lighting in the following areas:
6.1.2.1 Industrial shops
6.1.2.2 Vocational shops
6.1.2.3 Meeting rooms
6.1.2.4 Schools
6.1.2.5 Libraries
6.1.2.6 Chapels
6.1.2.7 Administration Offices

6.2 Battery Backup

Refer to Article 7. Battery Backup this section.

6.3 Percentage of Emergency Lighting

Refer to Article 8. Emergency Lighting Systems this section.

7. BATTERY BACKUP

7.1 Need for Battery or UPS System Back up

7.1.1 Design to include battery back up or UPS system for the areas or systems as listed.

7.1.2 Control Post and MCCP Room Lighting

- For ease of maintenance battery units may be located remotely.
- Capacity 4 hours full load continuous operation.

7.1.3 Critical Security and Life Safety Signal Systems

- For security and ease of maintenance battery units may be located remotely.
- Capacity 24 hours continuous operation.

7.1.4 Equipment Room Lighting

- Emergency generator room.
- Main electrical rooms
- Main security, life safety signal system control equipment rooms
- Main fire protection pump and heater rooms.
- Capacity 4 hours.

7.2 Requirements

7.2.1 When a battery powered system is required for secondary emergency backup for use in extra critical areas use the following type of unit.

7.2.2 Type of Battery backup:

- Unit emergency lighting equipment integral and remote heads. Voltage (6 volt, 12 volt, 24 volt) and capacity to suit the application. Automatic charging, automatic switching in event of power failure. Unit to meet *CSA Standard C22.2 No. 141-02 (2007)*[12] as a minimum.
- Unit plugs into circuit connected to the room lighting circuit that is fed from the emergency power distribution system. Plugs to be secured to receptacles.
- Do not consider use of central battery banks for emergency lighting. A central battery bank, for example, would not provide lighting in critical areas where individual circuits only have failed while there is no general power failure.

8. EMERGENCY LIGHTING SYSTEMS

8.1 Specify that the emergency lighting system operates automatically in the event of an interruption of the power supply to the normal lighting.

8.2 Design lighting system to provide adequate levels of illumination at all means of egress from a building such as doorways, corridors, lobbies, stairways, ramps or other facilities

[12] C22.2 No. 141-02 (R2007) -- Unit Equipment for Emergency Lighting

provided for the speedy evacuation of persons from a building or room to a public thoroughfare or other approved open space in case of emergency.

8.3 Battery powered backup units for secondary emergency backup is provided for lighting in extra critical areas.

9. EMERGENCY STANDBY SYSTEM

Emergency standby power set may be installed indoor inside a building or outdoor in a well equipped trailer. The building or the trailer may be located inside or outside the institution security fence.

9.1 General Requirements

9.1.1 Design an emergency standby based on the use of an emergency generator designed to serve the Institution's critical loads via automatic transfer switches and distributed throughout the premises in a separate wiring system.

9.1.2 Base emergency system design on the use of a diesel generator set, of capacity sufficient to supply the Institution's emergency loads and capable of generating on a standby basis the required kW rating at 0.8 power factor continuous.

9.1.3 Design total diesel generator capacity to be able to carry the total connected load, including definitely known "future loads" plus 25% spare capacity.

9.1.4 Specify security grill barriers for air intake Louvers as covered in this Technical Criteria Section M-4.

9.1.5 Optional depending on institution's acceptance and site conditions; the emergency generator may supplied by an off-site utility natural gas supply, conditions of *CSA Standard C282-09*[13] shall be met as a minimum.

9.1.6 Specify engine capable of operating at light loads for extended periods of time providing for precombustion of the fuel or a similar means for the prevention of carbonization.

9.1.7 To maintain environmental quality, engine is to be provided with a precombustion chamber fuel system or have suitable emission control equipment to ensure that gaseous exhaust emissions do not exceed the established maximum levels.

9.1.8 Generator set must be able to carry the institutional load within ten (10) seconds after failure of normal power. (Note: this exceeds *CSA Standard C282-09*, see footnote 9).

9.2 Engine (Diesel)

In specifying the engine, consider the following features and characteristics:

9.2.1 Reciprocating Engine: 2 or 4 cycle.

9.2.2 Minimum net brake power designed for continuous operation.
At altitudes above 500 meters and air intake temperatures above 32°C engines must be down rated for the elevation and temperature of the site of installation.

9.2.3 RPM - 1800.

9.2.4 Radiator and cooling 405 fan sized for continuous operation based on 405°C ambient air and 12.7 mm (½ inch) water gauge external static pressure.

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[13] CSA C282-09 -- Emergency electrical power supply for buildings

9.2.5 Fuel transfer system, fuel injection system, lube oil system and associated plumps, filters, etc.
9.2.6 Jacket water heating system designed to maintain minimum 37.8°C water temperature based on 10°C ambient and associated pump, heaters, etc.
9.2.7 Engine freeze up protection to -29°C ambient.
9.2.8 Starting Motor.
9.2.9 Governor electronic with hydraulic activator and load sensing, provision for paralleling, designed to ensure generator voltage, frequency and performance, and to provide backup protection to prevent engine runaway.
9.2.10 Heavy duty type air cleaners.
9.2.11 To be able to run on No. 2 Heating and Diesel oil.

9.3 Fuel Supply System

9.3.1 Main aboveground storage tank as per SOR/2008- 197 "Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations" and "Federal Regulations and Canadian Council of Ministers of Environment CCME Code of Practice 2003". Size of tank to be at least 2 days continuous operation at full load ultimate system.
9.3.2 Day tank: 1000 ℓ.
9.3.3 Automatic fuel transfer pumping system as well as manual pumping capability.
9.3.4 For fuel supply and return for engine consider need to return unused fuel from engine to main tank (not day tank). This may be required to prevent fuel in day tank from overheating.
9.3.5 Where the emergency generator is supplied by an off-site utility natural gas, the conditions of CSA C282-09 (see footnote 9) shall be met.

9.4 Engine Instrument Panel

9.4.1 Engine instrument panel containing:
9.4.1.1 All the necessary pressure, temperature and time gauges and indicators.
9.4.1.2 All the required high and low pressure and temperature alarm actuators for water, oil and over speed.
9.4.1.3 Terminal cabinet to accommodate internal and remote wiring.
9.4.1.4 Note engine instrument panel to be mounted independently from engine/generator set either mounted on pipe stand from floor or where practical in main control panel.
9.4.2 Required Controls and Instrumentation
9.4.2.1 Automatic and manual starting.
9.4.2.2 Manual remote emergency stop.
9.4.3 Automatic shut down and alarms on:
9.4.3.1 Overcranking
9.4.3.2 Over speed; out of frequency range.
9.4.3.3 High engine temperature
9.4.3.4 Low lube oil pressure
9.4.3.5 Short circuit
9.4.3.6 Alternator over and undervoltage
9.4.3.7 Lube oil high temperature.
9.4.4 Alarms only (below shutdown levels) on:
9.4.4.1 High engine temperature

9.4.4.2 Low lube oil pressure
9.4.4.3 Lube oil high temperature
9.4.4.4 Low fuel
9.4.4.5 Low battery
9.4.4.6 Low engine temperature

9.5 Generator

9.5.1 Heavy duty, single bearing, revolving field, brushless.
9.5.2 0.8 PF, 60 Hz.
9.5.3 Drip proof.
9.5.4 Amortisseur windings.
9.5.5 Dynamically balanced rotor permanently aligned to engine by SAE flexible disc coupling.
9.5.6 Exciter: rotating brushless or static with permanent magnet or series boost option.
9.5.7 EEMAC Class F insulation on rotor.
9.5.8 Alternator winding temperature rise not to exceed 80°C as measured by resistance at an ambient temperature of 40°C.
9.5.9 Voltage regulator to be solid state, silicon controlled rectifiers with phase controlled sensing circuit, regulation +1% no load to full load. Provide auto manual control module, hand trimmer adjustment and located inside control cubicle, suitable for parallel operation.
9.5.10 Voltage stability: plus or minus 0.5% maximum deviation about rated generator terminal voltage at any constant load, from no load to full load.
9.5.11 Voltage transient: 20% maximum deviation from rated generator terminal voltage on one step application or removal of full load.
9.5.12 Frequency stability: ¼% maximum deviation from rated generator terminal frequency at any constant load from no load to full load.
9.5.13 Frequency transient: 7% maximum deviation from rated generator terminal frequency one step application or removal of full load.
9.5.14 Voltage and frequency transient recovery time: 4 seconds maximum between one step application or removal of full load and the time generator terminal voltage and frequency recovers and remains within respective stability limits.
9.5.15 Terminal cabinet to accommodate internal and outgoing wiring with grounding provisions.
9.5.16 Identify alternator windings with metal tags. Bring windings to insulated terminals in a metal junction box mounted on the alternator. Size junction box to permit mounting of engine and alternator low voltage controls and wiring terminal blocks. Provide barrier in junction box to separate low and high voltage wiring.
9.5.17 Design generator set to minimize radio frequency interference (RFI) under all operating conditions. Balanced Telephone Influence Factor (TIF) to meet or better requirements of *EEMAC Standard M1-6, 1986*[14].
9.5.18 The alternator shall be capable of sustaining 300% rated current for a period not less than 10 seconds which would allow for selective tripping of down line pro-

[14] EEMAC Standard M1-6, 1986 -- EEMAC Standard for Motors and Generators

tective devices when a short circuit occurs. Alternator protection breaker trip curves to be matched against alternator damaged and decrement curves such that breaker trips before overcurrent situation damages alternator.

9.6 Motor Starting

9.6.1 Specify motor starting capability
- integrated system requirement including:
  - engine and governor
  - alternator and voltage regulator

9.6.2 Motor starting capability required in parallel and independent mode.

9.6.3 Indicate maximum motor horsepower _____.
or maximum motor starting KVA _____.
with system preloaded at _____kW and _____kVA.

9.6.4 Maximum voltage and frequency transient and recovery to be as indicated under 8.4 for full load step.
Note: In case of large high inertia motors it may be necessary (to avoid oversizing) to indicate that full recovery time to be calculated from instant motor reaches break away speed.

9.7 Standby Plant Control Panel

9.7.1 Specify enclosure of the following construction:

9.7.1.1 Dead front type, free standing, moisture proof, metal enclosed structure, bolted or welded steel framing of sufficient strength to maintain alignment and withstand maximum interrupting capacity.

9.7.1.2 Louvered, No. 12 gauge steel panels with locked hinged access covers.

9.7.2 Specify control panel to consist of 2 full height sections
- Section one for AC power, main breaker and terminations specify auxiliary transformer breakers and interlocks for control of ventilation
- Section two for engine start, control, alarm system.

9.7.3 As a minimum specify all alarms and controls to *CSA C282-09*[15].

9.7.4 Specify cranking cycle as follow:
Three automatic starting attempts shall be made. Each attempt shall be for 15 seconds with 15 second rest periods between cranking periods. At the end of the third unsuccessful starting attempt the overcrank alarm shall come on and enough battery capacity shall be remaining to conduct four more manual starting attempts.

9.7.5 Control Section to contain completely electronic, solid state control and alarm components for concept refer to PWC Standard (see Reference No. 1.3).

9.8 Main Circuit Breaker

Specify main protective device of rating compatible with generator output characteristics. Solid state protective relaying with adjustable long time and intermediate adjustable ranges.

9.9 Battery Charger

Specify automatic dual rate battery charger of the following characteristics and features:

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15 CSA C282-09 -- Emergency electrical power supply for buildings

9.9.1 Solid state, dual rate
9.9.2 AC line compensated
9.9.3 Stabilized output voltage with low voltage alarm, and limited output current.
9.9.4 Ampere rating, approximately 10 percent of 8 hour ampere/hour rating of battery.
9.9.5 With ammeter and voltmeter in front panel.
9.9.6 Housed in separate wall mounted enclosure adjacent to control panel, or mounted in control panel cover.
9.9.7 Low battery or malfunction alarm for connection to control room.

9.10 Batteries

Specify engine starting batteries to the following characteristics:

9.10.1 Lead calcium in transparent flame retardant jars and covers providing the required starting voltage.
9.10.2 Ampere/hour capacity sufficient to crank engine at constant firing speed in minimum room ambient of 21°C for a minimum of seven 15 second cranking cycles with 15 seconds of rests between attempts.

9.11 Silencer

Specify heavy duty, residential type exhaust silencer with companion flanges and piping, expansion joints, drain plug, finished in high temperature resistant paint.

9.12 Vibration Isolators

Specify vibration isolators of the following characteristics and features:
9.12.1 Spring type with neoprene acoustical pads, levelling devices and vertical limit stops.
9.12.2 25 mm minimum static deflection.

10. EMERGENCY POWER DISTRIBUTION

10.1 General Requirements

10.1.1 Arrange electrical distribution system so that no power interruption takes place on the non essential side of the distribution system while the generator is being exercised carrying all of its connected loads.
10.1.2 Arrange electrical distribution system so that sufficient capacity mobile generator can be connected to a box located on outside of the building. This box shall be protected against sabotaged etc. Connection of mobile generator should be possible without disconnecting any electrical cabling of distribution system.
10.1.3 Connection point for load bank should be provided for annual maintenance of generator. Connection should be possible without disconnecting any electrical cabling of distribution system.
10.1.4 Study ground fault protection considerations in systems with multiple neutral to ground connections. Neutral switching with overlapping contacts as part of the transfer switches may be one possible solution.

10.2 Automatic Transfer Switches

10.2.1 Specify the following accessories:

10.2.1.1 All engine controls to be part of the main engine generator control panel.

e.g. • time delay – auto start (signal received instantly from transfer switch(es)
• engine cool down – timing after normal power restored and all transfer switches returned to normal.

10.2.2 Each transfer switch equipped with:
- Voltage sensing, normal and emergency
- Instantaneous signal to control of normal power failure and return.
- Time delay on transfer to emergency (adjustable 0-60 sec.).
- Time delay on retransfer to normal after power returned (adjustable 0-300 sec.)
- Closed auxiliary contacts 2 on normal and 2 on emergency.
- Green pilot light to indicate "Normal" position amber pilot light to indicate "Emergency" position push-to-test emergency indicating pilot light with long life lamps and fuses.
- Test circuit for connection to central control (remote)
- Solid state type phase monitor with advance angle initiation, inhibiting transfer between two live sources until their phase angle difference is within plus or minus 5 electrical degrees.

10.2.3 Specify automatic transfer switches in accordance with *CSA C22.2 No. 178.1-07*[16] and relevant sections of *CSA C282-09*[17].

10.2.4 Specify contactor type transfer devices with single solenoid actuator.
Maximum transfer time from signal initiation 3 cycles. Standard of Acceptance "ASCO".

10.2.5 Consider available short circuit and transfer switch withstand capacity.
Short circuit operation - minimum 6 times rating (Standard)
Short circuit withstand - minimum 20 times loading rating (Standard)
Consider increasing switch size to attain withstand requirement.

10.2.6 If necessary to use current limiting fuses (in breakers), ensure fully co-ordinated throughout system.

10.2.7 Specify neutral only if required in which case specifies overlapping switched neutral.

10.2.8 Enclosing cabinet with flush mounted tumbler lock or switchboard mounted as indicated.

11. ENGINE/GENERATOR SWITCHBOARD

11.1 Switchboard for protection and control of engine/generator.

11.2 If suitable, subject to space layout and configuration specify engine/generator control panel to be included as part of the switchboard.

11.3 Switchboard to be equipped with output breaker for the generator. Circuit breaker shall be electrically operated drawout ACB Type.

12. REMOTE MONITORING SYSTEM

Emergency power system shall have remote monitoring capability located at the maintenance building to follow up the emergency power status from the chief of maintenance office.

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16 CSA C22.2 No. 178.1-07 – Requirements for Transfer Switches

17 CSA C282-09 – Emergency electrical power supply for buildings

13. OTHER DESIGN CONSIDERATIONS

13.1 Ensure adequate air supply for cooling and combustion system to consist of modulating damper arrangement discharge, intake, circulates to room, powered from emergency supply and arranged to open intake louver immediately on engine start.

13.3 Consider separate exhaust fan and heater to maintain acceptable temperatures in engine generator room throughout the year.

13.3 Specify installation of safety signs near generating plants. Signs to be 250 x 500 mm in size and to read as follows:

THIS UNIT OPERATES AUTOMATICALLY AND MAY START AT ANY MOMENT

DANGER

CET APPAREIL AUTOMATIQUE PEUT DEMARRER SUBITEMENT

14. TESTING

14.1 Specify factory testing and submission of results comprising 23 hrs at 100% load and one hr at 110% load. Readings of load tests to be taken at 30 minute intervals.

14.2 Specify on site testing, commissioning by manufacturer/ suppliers diesel/electric technician and submission of results.
Include - 8 hour full load test including 1 hour with 10% overload. Full function tests - all instruments, alarms and operation Vibration analysis.
All transfer switches and complete sequence testing.

14.3 Specify submission of forms for PWC/CSC approval 10 days before commencement of tests.

15. COMPUTER POWER SUPPLIES

15.1 Specify "Uninterruptible Power Supply" (UPS) systems for computers where short interruptions of power, such as between the loss of normal power and the start up of an emergency generator could result in loss of computer memory or information. Where computers are relatively close, a single UPS system may be used to serve several pieces of equipment.

15.2 UPS systems are required for Data Centers, LAN rooms, T&E rooms, CER, etc. Coordinate exact requirements for data network equipment with IMS infrastructure standards.

16. COMMISSIONING

16.1 Specify preparation of a load study as part of contract. Load study is to be reviewed and commented on design by the design engineer. Study is then to be submitted to CSC.

16.2 Load study is to contain full load current readings at the feeders connected to 50 ampere circuit interrupting devices and larger. Currents are to be read at the line side of the feeders if possible.

16.3 Load study is to contain voltage readings taken at the load side of the feeders. Adjust transformer taps to within 2% of rated voltage of equipment.

16.4 Load study is to identify loads ie. are they motors, lighting or heating.

16.5 Specify balancing of loads.

16.6 Specify for contractor to demonstrate that systems operate as design intended them to operate and that contractor must be prepared to operate each device, such as switches, relays etc., to the satisfaction of CSC and PWC involved in the acceptance procedure.

Correctional Service Canada | Service correctionnel Canada

SAFETY, RESPECT AND DIGNITY FOR ALL

LA SÉCURITÉ, LA DIGNITÉ ET LE RESPECT POUR TOUS

Technical Considerations
GO AND GI PROJECTS

CSC Building Identification and Room Numbering Standards

Canada

CSC Building Identification and Room Numbering Standards Institutional Buildings

1. A building number or letter will be provided by the Region Headquarters Facility Group for each new building.

2. Each individual building as defined by the Facility Database shown on the Infonet site as well as in the Condition Survey Documents is to have only 1 unique room number per floor (Other than for cells, bedrooms, and the like).

   a) The following room number conventions are to be used:
   b) Basement Level rooms are to be numbered **001, 002, 003,** etc.
   c) Ground or First Level rooms are to be numbered **101, 102, 103,** etc.
   d) Second Level rooms are to be numbered **201, 202, 203,** etc.
   e) Third Level rooms are to be numbered **301, 302, 303,** etc.
   f) And so on for the Fourth, Fifth, Sixth Levels.

3. In the case where there are more than 99 rooms per floor, the following are to be used:
   a) Ground Level ..... **198, 199, 1001, 1002, 1003,** etc.
   b) Second Level ..... **298, 299, 2001, 2002, 2003,** etc.
   c) Third Level ..... **398, 399, 3001, 3002, 3003,** etc.

4. Where rooms are accessible only by passing through another room or from a large room such as a gym, cafeteria, etc. (other than a corridor), then an alpha is used after the room number:
   a) Room 118**A** is accessible only through Room 118.
   b) Room 237**A and** 237**B** are only accessible through Room 237.
   c) Room 3003**A** is accessible only through Room 3003.

5. As long as a room has at least one door leading to a corridor, it will have a unique number. Any room with more than one access door from rooms that also have access from a corridor, etc. will have a unique number.

6. In times of emergency, lettering can be misunderstood but a unique room number is just that, unique. Also the convention is such that anyone transferring from one institution to another would have a reasonable knowledge of where a room is given a specific building.

7. As an example, if someone in an institution was told to go to Building XXX Room 331 the person would know to go to the 3rd floor to find 331. Similarly, to go to Room 006A in Building DDD, go to the basement, find Room 006 and enter it to find Room 006A.

8. In its simplest format:
   a) The first number in a three or four digit room number represents the floor.
   b) A letter after the room number represents access only from another room, not a corridor.
   c) There will always be exceptions to the standards and room numbers that could go either way but this will make these exceptions rare as opposed to commonplace.

9. Where rooms have multiple doors the room doors shall be hyphenated after the room number. Examples:
   a) The primary door 103-1 and secondary door 103-2.
   b) Sub rooms would similarly numbered be 103A-1 and 103A-2

Note: all doors shall be labeled with lamicod engraved door numbers. Locate door number at top of door hinge on securely mounted to the frame.