

VALENTIN ENGINEERING LTD
11 Camwood Crescent
North York, Ontario
M3A 3L3

C R Laurence Co., Inc.
65 Tiji Court
Concord, Ontario
L4K 5E4
Att: Ron Rehel

September 9, 2007

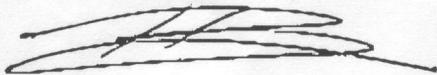
Re: Railing Design

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The new 2006 Ontario Building Code, released earlier this year, has not altered the design criteria for railings. Therefore the C R Laurence railing system is in compliance to the Ontario Building Code 2006, Section 4.1.10.1 "Loads on Guards" as per the original design.

Please call if you have any questions.

Sincerely Yours,



Valentin Brinovec, P.Eng.

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C R Laurence Co., Inc.
65 Tiji Court
Concord, Ontario
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Att: John Barber

October 23, 2007

Re: Railing Design Review

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The C R Laurence railing system has been reviewed for compliance to the Ontario Building Code 2006, Section 4.1.5.15 "Loads on Guards".

(A) Item #1 - 2 3/8" x 2 3/8" x 1/8" Standard Vertical Post

Properties: A = 1.028 in²
 I_x = 0.886 in⁴
 I_y = 0.886 in⁴
 S_x = 0.746 in³
 S_y = 0.746 in³
 F_y = 24655 psi for 6063-T6 Aluminum Alloy
 E = 10152000 psi

Based on a 42" cantilever, maximum post spacing to meet guard loading is 63". This value assumes that adequate post anchorage can be provided. This post spacing is also adequate for wind loading of up to 30 psf. Higher wind loads will require reduced post spacing.

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(B) Item #2 – Series 100, Top Rail

Properties: $A = 0.665 \text{ in}^2$
 $I_x = 0.339 \text{ in}^4$
 $I_y = 0.295 \text{ in}^4$
 $S_x = 0.245 \text{ in}^3$
 $S_y = 0.295 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Vertical loads govern on this rail type. To meet guard loading the maximum unsupported length is limited to 59". This value assumes that adequate anchorage to the posts can be provided. Based on a glass height of 36", this rail length is also adequate for wind loading of up to 68 psf. Higher wind loads will require reduced rail length.

(C) Item #3 – Series 200, Top Rail

Properties: $A = 0.744 \text{ in}^2$
 $I_x = 0.154 \text{ in}^4$
 $I_y = 1.012 \text{ in}^4$
 $S_x = 0.161 \text{ in}^3$
 $S_y = 0.675 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Vertical loads govern on this rail type. To meet guard loading the maximum unsupported length is limited to 47 1/2". This value assumes that adequate anchorage to the posts can be provided.

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(D) Item #4 – Series 300, Top Rail

Properties: $A = 0.881 \text{ in}^2$
 $I_x = 0.603 \text{ in}^4$
 $I_y = 1.149 \text{ in}^4$
 $S_x = 0.377 \text{ in}^3$
 $S_y = 0.766 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Vertical loads govern on this rail type. To meet guard loading the maximum unsupported length is limited to 73". This value assumes that adequate anchorage to the posts can be provided.

Item #5 – Bottom Rail For Glass

Properties: $A = 0.452 \text{ in}^2$
 $I_x = 0.102 \text{ in}^4$
 $I_y = 0.164 \text{ in}^4$
 $S_x = 0.101 \text{ in}^3$
 $S_y = 0.193 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Wind loads govern on this rail type. Based on a glass height of 36", this rail can be up to 79" long. Higher wind loads will require reduced rail length. This value assumes that adequate anchorage to the posts can be provided. At a length of 79" vertical deflection of the rail will be approximately 0.40" under the weight of the glass. Glass channels need to be deep enough to except this and still have sufficient glass bite.

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Item #6 – Bottom Rail For Pickets

Properties: $A = 0.446 \text{ in}^2$
 $I_x = 0.125 \text{ in}^4$
 $I_y = 0.193 \text{ in}^4$
 $S_x = 0.108 \text{ in}^3$
 $S_y = 0.227 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Guard loads govern on this rail type. Based on midpoint concentrated load, this rail can be up to 118" long. This value assumes that adequate anchorage to the posts can be provided. At a length of 118" vertical deflection will cause the pickets to dislodge from the rails under very low loads. Rail length should be restricted to approximately 55".

Item #7 – 11/16" x 11/16" Square Railing Pickets

Properties: $A = 0.288 \text{ in}^2$
 $I_x = 0.020 \text{ in}^4$
 $I_y = 0.019 \text{ in}^4$
 $S_x = 0.050 \text{ in}^3$
 $S_y = 0.051 \text{ in}^3$
 $F_y = 24655 \text{ psi}$ for 6063-T6 Aluminum Alloy
 $E = 10152000 \text{ psi}$

Guard loads govern on this rail type. Based on midpoint concentrated load, this picket can be up to 26" long if simply supported at the ends. If picket ends are fixed, the pickets can be the standard 36" long. This value assumes that adequate anchorage to the rails can be provided.

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Information Not Provided

1. No 350 Series top rail information provided.
2. Die drawings for any members. Properties for members can not be checked and confirmed as correct. Connection strengths can not be accurately determined as material thickness is required.
3. Spigot die drawing required to determine structural capacity of connections.
4. Information regarding connection of the railing posts to the structure. The physical design for the building structure will determine how a post can be anchored. Concrete, wood, steel all have different requirements as to fastener type and edge distance issues. Typically railing anchorage is designed on a project to project basis, but if some standard anchorage configurations are desired, a description of the structure is required.
5. Wind loads will have a dramatic affect on railing design. As building height increases, wind loads become the governing factor in railing design. The current data provided above assumes railings are on low-rise structures only.

Summary

- (A) Post Spacing should not exceed 63" O.C.
 - (B) Series 100 top rail should not exceed 59" in length
 - (C) Series 200 top rail should not exceed 47 ½" in length
 - (D) Series 300 top rail should not exceed 73" in length
- Bottom rail for glass should not exceed 79" in length
Bottom rail for pickets should not exceed 55" in length

The above information is based on a minimum 6063-T6 aluminum alloy, structurally adequate connections and material properties provided. Please call if you have any questions.

Sincerely Yours,
Valentin Brinovec, P.Eng.