



January 30, 2025

**To:** Whom it may concern,  
**From:** Building Drops, Inc.  
**On behalf of:** Glass Warehouse LLC / FutureGlass  
1319 Rocky Point Drive, Suite 200  
Oceanside, CA 92056  
**Report:** PER 9361  
**Subject:** Fabrikasi Posted Glass Railing System

**Scope:**

The purpose of this report is to evaluate the performance of the Fabrikasi Posted Glass Railing System manufactured by Glass Warehouse LLC / FutureGlass. The conditions in this report meet all the applicable requirements of the current International Building Code. Glass thicknesses and properties were extracted from ASTM E1300. Aluminum members and connections were designed according to ADM Design Guides. ICC Acceptance Criteria AC439 and ASTM E2358 were used for determining applicable design criteria for railing systems. A summary of standards can be found on the following pages.

Only rectangular glass is covered within this report, different glass shapes do not apply to this analysis. Gaskets may be modified according to different glass thicknesses as long as thickness is specified in this analysis.

The posted glass railing system uses Aluminum 6063-T5 posts and top rails to support the glass lights specified herein. The posted glass system has been designed for the following loading conditions:

- 200 lb concentrated load at the top of glass or at the top rail
- 50 lbs linear load applied at the top of glass or at the top rail
- Allowable wind load as shown on the tables within this report

This report provides glass thicknesses the posts have been designed to support. Other glass thicknesses may be used but are outside of the scope of this report.

**Instructions for Use**

1. Select post spacing and height based on jobsite wind loads using tables 2, 4, and 6.
2. Select anchor type with allowable wind load higher than step 1 from tables 7 through 10.
3. Select Glass Type with allowable wind load higher than step 1 from tables 12 through 18.

|   |                        |   |                      |
|---|------------------------|---|----------------------|
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**Fabrikasi Posted Glass Railing System**



**Standards/Referenced Publications**

|                  |                    |  |
|------------------|--------------------|--|
| ASTM E1300       | IBC 1607.8.1       | ICC AC439                                      |
| ASTM E2358       | AISC Design Guides | ASTM C1048-97b                                 |
| CPSC 16 CFR 1201 | ANSI Z97.1         | AAMA CW-12-84, Structural Properties for glass |
| ADM 2018         | IBC 2407.1.1       | NDS 2018                                       |
| ASTM E6.2.1.1    | SEI/ASCE 8-02      |  |

**Limits of Use:**

1. This product has been evaluated and is in compliance with the 2015, 2018, and 2021 editions of the International Building Code.
2. Product installation shall be as listed herein. Site conditions that deviate from those specified shall require further engineering analysis by a licensed engineer or registered architect.
3. When used in areas requiring wind borne debris protection this product complies with chapter 16 of the 2015, 2018, and 2021 editions of the International Building Code and does require an impact resistant covering in areas requiring impact resistance.

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**Conclusion:**

In my professional opinion, the Fabrikasi Posted Glass Railing System manufactured by Glass Warehouse LLC / FutureGlass is adequate for use under the limitations provided within this report.

I trust that this will satisfy your needs, however, feel free to call if you have any questions.



**Certification of Independence:** Please note that I do not have nor will I acquire a financial interest in any company manufacturing or distributing the product(s) for which this report is being issued. Also, I do not have nor will I acquire a financial interest in any other entity involved in the approval process of the listed product(s).

|   |                        |   |                      |
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**Analysis and Findings:**

**Posts Allowable Heights and Wind Loads:**

The stainless-steel post was analyzed for the maximum allowable heights at various post spacings due to the following design loads:

- 200 lb Concentrated Load at the top of the post
- 50 lb/ft Linear Load along the handrail or along the top of the glass
- Allowable Wind Load due to Post Spacing and Height

**Intermediate Post Analysis:**

**Table 1: Maximum Allowable Height of Post**

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Post Spacing (in.)          |       |       |       |       |       |       |       |
| 36                          | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 78.11                       | 78.11 | 78.11 | 69.43 | 62.49 | 56.81 | 52.07 | 48.07 |

**Table 2: Maximum Allowable Wind Load of Post**

| ALLOWABLE POST WIND LOAD (PSF) |                    |       |       |       |       |       |       |       |
|--------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| POST HEIGHT (IN.)              | POST SPACING (IN.) |       |       |       |       |       |       |       |
|                                | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                             | 87.66              | 75.14 | 65.75 | 58.44 | 52.60 | 47.82 | 43.83 | 40.46 |
| 42                             | 64.41              | 55.21 | 48.31 | 42.94 | 38.64 | 35.13 | 32.20 | 29.73 |
| 48                             | 49.31              | 42.27 | 36.98 | 32.87 | 29.59 | 26.90 | 24.66 | 22.76 |
| 54                             | 38.96              | 33.40 | 29.22 | 25.97 | 23.38 | 21.25 | -     | -     |
| 60                             | 31.56              | 27.05 | 23.67 | 21.04 | 18.94 | -     | -     | -     |

\*Note: Cells in table which have a “-” are not qualified under this report due to the maximum height being exceeded from the values shown in table 1.

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**End Post Analysis:**

**Table 3: Maximum Allowable Height of Post**

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Trib. Post Spacing (in.)    |       |       |       |       |       |       |       |
| 36                          | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 74.34                       | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 |

**Table 4: Maximum Allowable Wind Load of Post**

| ALLOWABLE POST WIND LOAD (PSF) |                    |        |        |        |        |       |       |       |
|--------------------------------|--------------------|--------|--------|--------|--------|-------|-------|-------|
| POST HEIGHT (IN.)              | POST SPACING (IN.) |        |        |        |        |       |       |       |
|                                | 36                 | 42     | 48     | 54     | 60     | 66    | 72    | 78    |
| 36                             | 166.87             | 143.03 | 125.15 | 111.25 | 100.12 | 91.02 | 83.43 | 77.02 |
| 42                             | 122.60             | 105.08 | 91.95  | 81.73  | 73.56  | 66.87 | 61.30 | 56.58 |
| 48                             | 93.86              | 80.45  | 70.40  | 62.58  | 56.32  | 51.20 | 46.93 | 43.32 |
| 54                             | 74.16              | 63.57  | 55.62  | 49.44  | 44.50  | 40.45 | 37.08 | 34.23 |
| 60                             | 60.07              | 51.49  | 45.05  | 40.05  | 36.04  | 32.77 | 30.04 | 27.73 |

**90° Corner Post Analysis:**

**Table 5: Maximum Allowable Height of Post**

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Trib. Post Spacing (in.)    |       |       |       |       |       |       |       |
| 36                          | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 59.47                       | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 |

**Table 6: Maximum Allowable Wind Load of Post**

| ALLOWABLE POST WIND LOAD (PSF) |                    |        |        |       |       |       |       |       |
|--------------------------------|--------------------|--------|--------|-------|-------|-------|-------|-------|
| POST HEIGHT (IN.)              | POST SPACING (IN.) |        |        |       |       |       |       |       |
|                                | 36                 | 42     | 48     | 54    | 60    | 66    | 72    | 78    |
| 36                             | 133.49             | 114.42 | 100.12 | 89.00 | 80.10 | 72.82 | 66.75 | 61.61 |
| 42                             | 98.08              | 84.07  | 73.56  | 65.39 | 58.85 | 53.50 | 49.04 | 45.27 |
| 48                             | 75.09              | 64.36  | 56.32  | 50.06 | 45.05 | 40.96 | 37.55 | 34.66 |
| 54                             | 59.33              | 50.86  | 44.50  | 39.55 | 35.60 | 32.36 | 29.67 | 27.38 |
| 60                             | -                  | -      | -      | -     | -     | -     | -     | -     |

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**Post Installation Analysis:**

**Anchor Summary Table**

| Anchor Schedule |             |                          |                    |                       |                 |                     |
|-----------------|-------------|--------------------------|--------------------|-----------------------|-----------------|---------------------|
| Option          | Anchor Type | Brand                    | Substrate Capacity | Anchor Diameter (in.) | Embedment (in.) | Edge Distance (in.) |
| A               | Wood        | 5/16" Lag Screw          | 0.55 S.G.          | 0.3125                | 1.50            | 0.75                |
| B               |             | 3/8" Lag Screw           | 0.55 S.G.          | 0.375                 | 1.50            | 0.75                |
| C               |             | 1/2" Lag Screw           | 0.55 S.G.          | 0.5                   | 1.50            | 0.75                |
| D               | Steel       | 5/16" Self-Tapping Screw | 45000 psi          | 0.3125                | 3 Threads       | 0.50                |
| E               |             | 3/8" Self-Tapping Screw  | 45000 psi          | 0.375                 | 3 Threads       | 0.50                |
| F               |             | 1/2" Self-Tapping Screw  | 45000 psi          | 0.5                   | 3 Threads       | 0.50                |
| G               | Concrete    | 1/4" Dewalt Screw-Bolt+  | 3000 psi           | 0.25                  | 2.50            | 3.00                |
| H               |             | 3/8" Dewalt Screw-Bolt+  | 3000 psi           | 0.375                 | 2.50            | 3.00                |
| I               |             | 1/2" Dewalt Screw-Bolt+  | 3000 psi           | 0.5                   | 2.50            | 3.00                |

**Table 7: Anchor Type G**

| ALLOWABLE ANCHOR WIND LOAD (PSF) |                    |       |       |       |       |       |       |       |
|----------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| POST HEIGHT (IN.)                | POST SPACING (IN.) |       |       |       |       |       |       |       |
|                                  | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                               | 43.59              | 37.36 | 32.69 | 29.06 | 26.15 | 23.78 | 21.80 | 20.12 |
| 42                               | 32.03              | 27.45 | 24.02 | 21.35 | 19.22 | 17.47 | 16.01 | 14.78 |
| 48                               | 24.52              | 21.02 | 18.39 | 16.35 | 14.71 | 13.37 | 12.26 | 11.32 |
| 54                               | 19.37              | 16.61 | 14.53 | 12.92 | 11.62 | 10.57 | 9.69  | 8.94  |
| 60                               | 15.69              | 13.45 | 11.77 | 10.46 | 9.42  | 8.56  | 7.85  | 7.24  |

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**Table 8: Anchor Types A & D**

| ALLOWABLE ANCHOR WIND LOAD (PSF) |                    |       |       |       |       |       |       |       |
|----------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| POST HEIGHT<br>(IN.)             | POST SPACING (IN.) |       |       |       |       |       |       |       |
|                                  | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                               | 48.44              | 41.52 | 36.33 | 32.30 | 29.07 | 26.42 | 24.22 | 22.36 |
| 42                               | 35.59              | 30.51 | 26.69 | 23.73 | 21.36 | 19.41 | 17.80 | 16.43 |
| 48                               | 27.25              | 23.36 | 20.44 | 18.17 | 16.35 | 14.86 | 13.63 | 12.58 |
| 54                               | 21.53              | 18.46 | 16.15 | 14.35 | 12.92 | 11.74 | 10.77 | 9.94  |
| 60                               | 17.44              | 14.95 | 13.08 | 11.63 | 10.46 | 9.51  | 8.72  | 8.05  |

**Table 9: Anchor Types B, E, & H**

| ALLOWABLE ANCHOR WIND LOAD (PSF) |                    |       |       |       |       |       |       |       |
|----------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| POST HEIGHT<br>(IN.)             | POST SPACING (IN.) |       |       |       |       |       |       |       |
|                                  | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                               | 56.70              | 48.60 | 42.53 | 37.80 | 34.02 | 30.93 | 28.35 | 26.17 |
| 42                               | 41.66              | 35.71 | 31.24 | 27.77 | 24.99 | 22.72 | 20.83 | 19.23 |
| 48                               | 31.89              | 27.34 | 23.92 | 21.26 | 19.14 | 17.40 | 15.95 | 14.72 |
| 54                               | 25.20              | 21.60 | 18.90 | 16.80 | 15.12 | 13.75 | 12.60 | 11.63 |
| 60                               | 20.41              | 17.50 | 15.31 | 13.61 | 12.25 | 11.13 | 10.21 | 9.42  |

**Table 10: Anchor Types C, F, & I**

| ALLOWABLE ANCHOR WIND LOAD (PSF) |                    |       |       |       |       |       |       |       |
|----------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| POST HEIGHT<br>(IN.)             | POST SPACING (IN.) |       |       |       |       |       |       |       |
|                                  | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                               | 70.44              | 60.38 | 52.83 | 46.96 | 42.26 | 38.42 | 35.22 | 32.51 |
| 42                               | 51.75              | 44.36 | 38.81 | 34.50 | 31.05 | 28.23 | 25.88 | 23.88 |
| 48                               | 39.62              | 33.96 | 29.72 | 26.41 | 23.77 | 21.61 | 19.81 | 18.29 |
| 54                               | 31.31              | 26.83 | 23.48 | 20.87 | 18.78 | 17.08 | 15.65 | 14.45 |
| 60                               | 25.36              | 21.74 | 19.02 | 16.91 | 15.21 | 13.83 | 12.68 | 11.70 |

|   |                        |   |                      |
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**Glass Strength**

**Table 11: Glass properties extracted from ASTM E1300**

| Glass Properties  |                         |                          |                              |                                       |
|-------------------|-------------------------|--------------------------|------------------------------|---------------------------------------|
| Glass types       | Modulus of rupture, psi | All. Bending Stress, psi | All. Compressive Stress, psi | All. Glass Stress per ASTM E1300, psi |
| Tempered          | 24000                   | 6000                     | 6000                         | 9600                                  |
| Heat Strengthened | 12000                   | 3000                     | 3000                         | 5300                                  |
| Annealed          | 6000                    | 1500                     | 1500                         | 2900                                  |

**Table 12: 5/16" Monolithic Tempered Glass Allowable Wind Loads**

| Allowable Wind Load Table (PSF) - 5/16" Tempered Glass |                    |       |       |       |       |       |       |      |
|--|--------------------|-------|-------|-------|-------|-------|-------|------|
| Glass Height (in.)                                     | Post Spacing (in.) |       |       |       |       |       |       |      |
|  | 36.0               | 42.0  | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0 |
| 36.0   | 121.26             | 89.09 | 68.21 | -     | -     | -     | -     | -    |
| 42.0   | 121.26             | 89.09 | 68.21 | 53.90 | -     | -     | -     | -    |
| 48.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | -     | -     | -    |
| 54.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | 36.08 | -     | -    |
| 60.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | 36.08 | 30.32 | -    |

**Table 13: 3/8" Monolithic Tempered Glass Allowable Wind Loads**

| Allowable Wind Load Table (PSF) - 3/8" Tempered Glass |                    |        |        |       |       |       |       |       |
|---|--------------------|--------|--------|-------|-------|-------|-------|-------|
| Glass Height (in.)                                    | Post Spacing (in.) |        |        |       |       |       |       |       |
|   | 36.0               | 42.0   | 48.0   | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 36.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | -     |
| 42.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 48.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 54.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 60.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |

|   |                        |   |                      |
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**Table 14: 1/2" Monolithic Tempered Glass Allowable Wind Loads**

| Allowable Wind Load Table (PSF) - 1/2" Tempered Glass |                    |        |        |        |        |       |       |       |
|---|--------------------|--------|--------|--------|--------|-------|-------|-------|
| Glass Height (in.)                                    | Post Spacing (in.) |        |        |        |        |       |       |       |
|   | 36.0               | 42.0   | 48.0   | 54.0   | 60.0   | 66.0  | 72.0  | 78.0  |
| 36.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 42.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 48.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 54.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 60.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |

**Table 15: 7/16" Laminated Glass: 3/16" Tempered Glass – 0.060" PVB – 3/16" Tempered Glass**

| Allowable Wind Load Table (PSF) |                    |        |       |       |       |       |       |       |
|---------------------------------|--------------------|--------|-------|-------|-------|-------|-------|-------|
| Glass Height (in.)              | Post Spacing (in.) |        |       |       |       |       |       |       |
|                                 | 36.0               | 42.0   | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 36.0                            | 136.76             | 108.18 | 88.40 | 73.92 | -     | -     | -     | -     |
| 42.0                            | 136.76             | 108.18 | 88.40 | 73.92 | 62.87 | 54.18 | -     | -     |
| 48.0                            | 136.76             | 108.18 | 88.40 | 73.92 | 62.87 | 54.18 | 47.19 | 41.46 |
| 54.0                            | 136.76             | 108.18 | 88.40 | 73.92 | 62.87 | 54.18 | 47.19 | 41.46 |
| 60.0                            | 136.76             | 108.18 | 88.40 | 73.92 | 62.87 | 54.18 | 47.19 | 41.46 |

**Table 16: 7/16" Laminated Glass: 3/16" Tempered Glass – 0.060" SentryGlas – 3/16" Tempered Glass**

| Allowable Wind Load Table (PSF) |                    |        |        |        |       |       |       |       |
|---------------------------------|--------------------|--------|--------|--------|-------|-------|-------|-------|
| Glass Height (in.)              | Post Spacing (in.) |        |        |        |       |       |       |       |
|                                 | 36.0               | 42.0   | 48.0   | 54.0   | 60.0  | 66.0  | 72.0  | 78.0  |
| 36.0                            | 234.71             | 175.24 | 135.62 | 107.97 | 87.93 | 72.97 | 61.51 | 52.54 |
| 42.0                            | 234.71             | 175.24 | 135.62 | 107.97 | 87.93 | 72.97 | 61.51 | 52.54 |
| 48.0                            | 234.71             | 175.24 | 135.62 | 107.97 | 87.93 | 72.97 | 61.51 | 52.54 |
| 54.0                            | 234.71             | 175.24 | 135.62 | 107.97 | 87.93 | 72.97 | 61.51 | 52.54 |
| 60.0                            | 234.71             | 175.24 | 135.62 | 107.97 | 87.93 | 72.97 | 61.51 | 52.54 |

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**Table 17: 9/16" Laminated Glass: 1/4" Tempered Glass – 0.060" PVB – 1/4" Tempered Glass**

| Allowable Wind Load Table (PSF) |                    |        |        |        |       |       |       |       |
|---------------------------------|--------------------|--------|--------|--------|-------|-------|-------|-------|
| Glass Height (in.)              | Post Spacing (in.) |        |        |        |       |       |       |       |
|                                 | 36.0               | 42.0   | 48.0   | 54.0   | 60.0  | 66.0  | 72.0  | 78.0  |
| 36.0                            | 188.09             | 147.78 | 120.28 | 100.39 | 85.34 | 73.58 | 64.16 | -     |
| 42.0                            | 188.09             | 147.78 | 120.28 | 100.39 | 85.34 | 73.58 | 64.16 | 56.47 |
| 48.0                            | 188.09             | 147.78 | 120.28 | 100.39 | 85.34 | 73.58 | 64.16 | 56.47 |
| 54.0                            | 188.09             | 147.78 | 120.28 | 100.39 | 85.34 | 73.58 | 64.16 | 56.47 |
| 60.0                            | 188.09             | 147.78 | 120.28 | 100.39 | 85.34 | 73.58 | 64.16 | 56.47 |

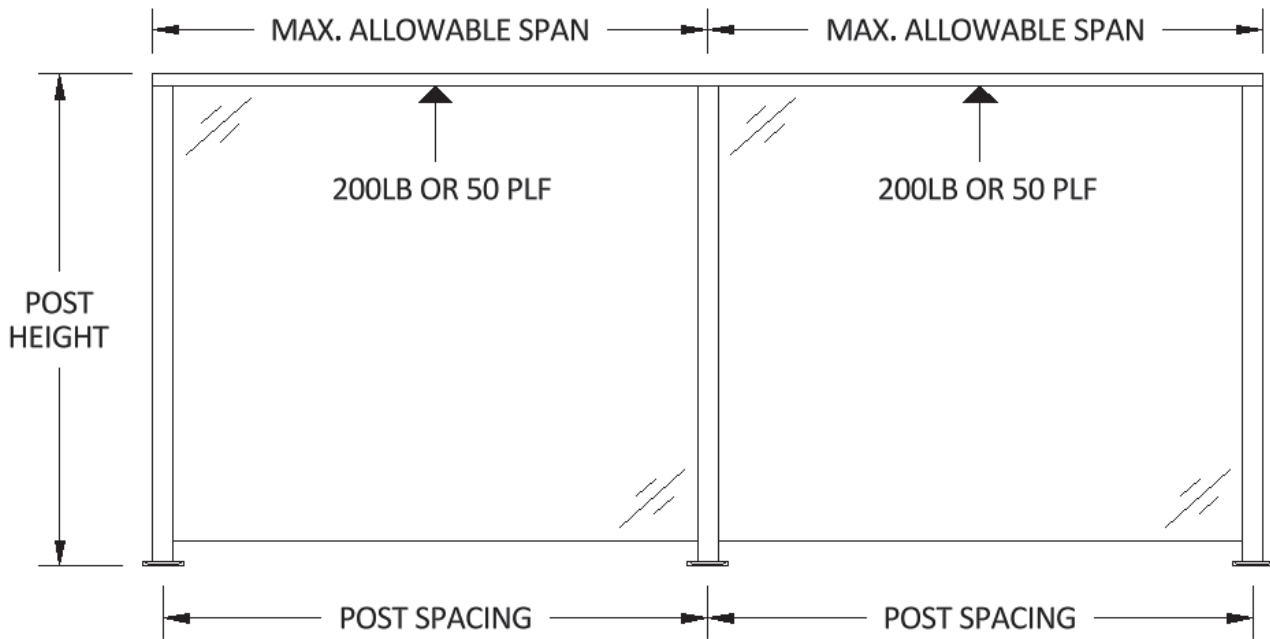
**Table 18: 9/16" Laminated Glass: 1/4" Tempered Glass – 0.060" SentryGlas – 1/4" Tempered Glass**

| Allowable Wind Load Table (PSF) |                    |        |        |        |        |        |       |       |
|---------------------------------|--------------------|--------|--------|--------|--------|--------|-------|-------|
| Glass Height (in.)              | Post Spacing (in.) |        |        |        |        |        |       |       |
|                                 | 36.0               | 42.0   | 48.0   | 54.0   | 60.0   | 66.0   | 72.0  | 78.0  |
| 36.0                            | 326.39             | 244.36 | 189.49 | 151.07 | 123.16 | 102.29 | 86.27 | 73.73 |
| 42.0                            | 326.39             | 244.36 | 189.49 | 151.07 | 123.16 | 102.29 | 86.27 | 73.73 |
| 48.0                            | 326.39             | 244.36 | 189.49 | 151.07 | 123.16 | 102.29 | 86.27 | 73.73 |
| 54.0                            | 326.39             | 244.36 | 189.49 | 151.07 | 123.16 | 102.29 | 86.27 | 73.73 |
| 60.0                            | 326.39             | 244.36 | 189.49 | 151.07 | 123.16 | 102.29 | 86.27 | 73.73 |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 10 of 39 |

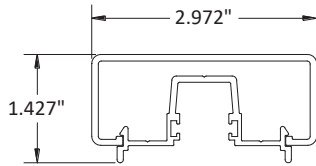
**Cap Rail Allowable Span Calculations**

Guard applications require a top rail or handrail. The rail shall have adequate strength to support the live load of 200 lb concentrated or 50 plf distributed load assuming the failure of one glass light at the location of the loading. No US building codes or adopted standards define the limit state of the guard cap rail for this condition. IBC 2407.1.2 states “shall be otherwise supported to remain in place should one baluster fail.” There is no additional explanation in the IBC as to how this is to be determined. ICC Acceptance Criteria 439 was adopted to provide a methodology for determining if a glass balustrade guard meets the requirements of IBC 2407. ICC AC 439 requires the rail to be capable of supporting a 334# load (SF = 1.67 for 200# load) with no more than 12” deflection, yielding or other damage is permitted since the loss of a glass light will necessitate guard repairs. For light failure only the horizontal load case applies for laminated glass.



|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 11 of 39 |

**GSW005/006 Top Rail Allowable Span**



Top Rail = GSW 005/006

- Area = 0.8653 in<sup>2</sup>
- Perim. = 22.1741 in
- Ixx = 0.1840 in<sup>4</sup>
- Iyy = 0.8134 in<sup>4</sup>
- rx = 0.4611 in
- ry = 0.9695 in
- Cxx = 1.4862 in
- Cyy = 0.8367 in
- Sxx = 0.2199 in<sup>3</sup>
- Syy = 0.5473 in<sup>3</sup>
- t = 0.087 in
- w = 0.8349 in
- Material = 6063-T5
- Fy = 21 ksi
- Fu = 27 ksi

$$M_n = 1.25S_e F_y$$

- M<sub>n Vertical Load</sub> = 5.7727 k-in
- M<sub>n Horizontal Load</sub> = 14.3667 k-in

**Simply Supported Rail**

$$M_w = wL^2/10$$

- L<sub>uniform Vert.</sub> = 117.70 in
- L<sub>uniform Horiz.</sub> = 185.69 in

$$M_c = PL/5$$

- L<sub>concentrated vert.</sub> = 144.32 in
- L<sub>concentrated horiz.</sub> = 359.17 in

**Allowable Rail Span = 117 in = 9.75 ft**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
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# APPENDIX

|  |                        |   |                       |
|--|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass<br>Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|  |                        | Project #: EEV-24-0628                      |                       |
|  | Engineer: SH           | PER: 9361                                   | Page #: Page 13 of 39 |



**Aluminum Post**

Post Name = Intermediate Post  
 Post Material = 6063-T5  
 Modulus of Elasticity = 10100000 lbs/in<sup>2</sup>  
 F<sub>y</sub> = 21000 lbs/in<sup>2</sup>  
 I<sub>xx</sub> = 0.5762 in<sup>4</sup>  
 I<sub>yy</sub> = 0.3996 in<sup>4</sup>  
 S<sub>xx</sub> = 0.5854 in<sup>3</sup>  
 S<sub>yy</sub> = 0.4060 in<sup>3</sup>  
 Z<sub>xx</sub> = 0.7439 in<sup>3</sup>  
 Z<sub>yy</sub> = 0.5640 in<sup>3</sup>  
 Allowable Post Moment, M<sub>a</sub> = 15621.9 lbs-in

Max. Height Due to 200lb Concentrated Load at Top of Post

M<sub>200</sub> = 200\*H  
 Max. Post Height = 78.11 in

Max. Heights Due to 50 lb/ft Load at Various Post Spacings

M<sub>50plf</sub> = 50/12\*H\*S

| Max. Height (in.)  |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Post Spacing (in.) |       |       |       |       |       |       |       |
| 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 104.15             | 89.27 | 78.11 | 69.43 | 62.49 | 56.81 | 52.07 | 48.07 |

Max. Allowable Height

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Post Spacing (in.)          |       |       |       |       |       |       |       |
| 36                          | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 78.11                       | 78.11 | 78.11 | 69.43 | 62.49 | 56.81 | 52.07 | 48.07 |

Allowable Wind Load Due to Allowable Moment of Post

W = (144\*M<sub>a</sub>)/(0.55\*S\*H<sup>2</sup>)

| Allowable Wind Load (PSF) |                    |       |       |       |       |       |       |       |
|---------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Post Height (in)          | Post Spacing (in.) |       |       |       |       |       |       |       |
|                           | 36                 | 42    | 48    | 54    | 60    | 66    | 72    | 78    |
| 36                        | 87.66              | 75.14 | 65.75 | 58.44 | 52.60 | 47.82 | 43.83 | 40.46 |
| 42                        | 64.41              | 55.21 | 48.31 | 42.94 | 38.64 | 35.13 | 32.20 | 29.73 |
| 48                        | 49.31              | 42.27 | 36.98 | 32.87 | 29.59 | 26.90 | 24.66 | 22.76 |
| 54                        | 38.96              | 33.40 | 29.22 | 25.97 | 23.38 | 21.25 | -     | -     |
| 60                        | 31.56              | 27.05 | 23.67 | 21.04 | 18.94 | -     | -     | -     |

|   |                        |   |  |
|---|------------------------|---|--|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |  |
|   | Engineer: SH           | Project #: EEV-24-0628                      |  |
|   | PER: 9361              | Page #: Page 14 of 39                       |  |



**Aluminum Post**

PostName = End Post  
 Post Material = 6063-T5  
 Modulus of Elasticity = 10100000 lbs/in<sup>2</sup>  
 F<sub>y</sub> = 21000 lbs/in<sup>2</sup>  
 I<sub>xx</sub> = 0.5587 in<sup>4</sup>  
 I<sub>yy</sub> = 0.4328 in<sup>4</sup>  
 S<sub>xx</sub> = 0.5676 in<sup>3</sup>  
 S<sub>yy</sub> = 0.4306 in<sup>3</sup>  
 Z<sub>xx</sub> = 0.7080 in<sup>3</sup>  
 Z<sub>yy</sub> = 0.5838 in<sup>3</sup>  
 Allowable Post Moment, M<sub>s</sub> = 14868.0 lbs-in

Max. Height Due to 200lb Concentrated Load at Top of Post

M<sub>200</sub> = 200 \* H  
 Max. Post Height = 74.34 in

Max. Heights Due to 50 lb/ft Load at Various Post Spacings

M<sub>50aft</sub> = 50/12 \* H \* S

| Max. Height (in.)        |        |        |        |        |        |       |       |
|--------------------------|--------|--------|--------|--------|--------|-------|-------|
| Trib. Post Spacing (in.) |        |        |        |        |        |       |       |
| 18                       | 21     | 24     | 27     | 30     | 33     | 36    | 39    |
| 198.24                   | 169.92 | 148.68 | 132.16 | 118.94 | 108.13 | 99.12 | 91.50 |

Max. Allowable Height

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Trib. Post Spacing (in.)    |       |       |       |       |       |       |       |
| 18                          | 21    | 24    | 27    | 30    | 33    | 36    | 39    |
| 74.34                       | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 | 74.34 |

Allowable Wind Load Due to Allowable Moment of Post

W = (144 \* M<sub>s</sub>) / (0.55 \* S \* H<sup>2</sup>)

| Allowable Wind Load (PSF) |                          |        |        |        |        |       |       |       |
|---------------------------|--------------------------|--------|--------|--------|--------|-------|-------|-------|
| Post Height (in)          | Trib. Post Spacing (in.) |        |        |        |        |       |       |       |
|                           | 18                       | 21     | 24     | 27     | 30     | 33    | 36    | 39    |
| 36                        | 166.87                   | 143.03 | 125.15 | 111.25 | 100.12 | 91.02 | 83.43 | 77.02 |
| 42                        | 122.60                   | 105.08 | 91.95  | 81.73  | 73.56  | 66.87 | 61.30 | 56.58 |
| 48                        | 93.86                    | 80.45  | 70.40  | 62.58  | 56.32  | 51.20 | 46.93 | 43.32 |
| 54                        | 74.16                    | 63.57  | 55.62  | 49.44  | 44.50  | 40.45 | 37.08 | 34.23 |
| 60                        | 60.07                    | 51.49  | 45.05  | 40.05  | 36.04  | 32.77 | 30.04 | 27.73 |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 15 of 39 |



**Aluminum Post**

Post Name = 90° Post  
 Post Material = 6063-T5  
 Modulus of Elasticity = 10100000 lbs/in<sup>2</sup>  
 F<sub>y</sub> = 21000 lbs/in<sup>2</sup>  
 I<sub>xx</sub> = 0.4294 in<sup>4</sup>  
 I<sub>yy</sub> = 0.4294 in<sup>4</sup>  
 S<sub>xx</sub> = 0.4283 in<sup>3</sup>  
 S<sub>yy</sub> = 0.4283 in<sup>3</sup>  
 Z<sub>xx</sub> = 0.5664 in<sup>3</sup>  
 Z<sub>yy</sub> = 0.5664 in<sup>3</sup>  
 Allowable Post Moment, M<sub>a</sub> = 11894.4 lbs-in

Max. Height Due to 200lb Concentrated Load at Top of Post

M<sub>200</sub> = 200 \* H  
 Max. Post Height = 59.47 in

Max. Heights Due to 50 lb/ft Load at Various Post Spacings

M<sub>50plf</sub> = 50/12 \* H \* S

| Max. Height (in.)        |        |        |        |       |       |       |       |
|--------------------------|--------|--------|--------|-------|-------|-------|-------|
| Trib. Post Spacing (in.) |        |        |        |       |       |       |       |
| 18                       | 21     | 24     | 27     | 30    | 33    | 36    | 39    |
| 158.59                   | 135.94 | 118.94 | 105.73 | 95.16 | 86.50 | 79.30 | 73.20 |

Max. Allowable Height

| Max. Allowable Height (in.) |       |       |       |       |       |       |       |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Trib. Post Spacing (in.)    |       |       |       |       |       |       |       |
| 18                          | 21    | 24    | 27    | 30    | 33    | 36    | 39    |
| 59.47                       | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 | 59.47 |

Allowable Wind Load Due to Allowable Moment of Post

W = (144 \* M<sub>a</sub>) / (0.55 \* S \* H<sup>2</sup>)

| Allowable Wind Load (PSF) |                          |        |        |       |       |       |       |       |
|---------------------------|--------------------------|--------|--------|-------|-------|-------|-------|-------|
| Post Height (in)          | Trib. Post Spacing (in.) |        |        |       |       |       |       |       |
|                           | 18                       | 21     | 24     | 27    | 30    | 33    | 36    | 39    |
| 36                        | 133.49                   | 114.42 | 100.12 | 89.00 | 80.10 | 72.82 | 66.75 | 61.61 |
| 42                        | 98.08                    | 84.07  | 73.56  | 65.39 | 58.85 | 53.50 | 49.04 | 45.27 |
| 48                        | 75.09                    | 64.36  | 56.32  | 50.06 | 45.05 | 40.96 | 37.55 | 34.66 |
| 54                        | 59.33                    | 50.86  | 44.50  | 39.55 | 35.60 | 32.36 | 29.67 | 27.38 |
| 60                        | -                        | -      | -      | -     | -     | -     | -     | -     |

|   |                        |   |  |
|---|------------------------|---|--|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |  |
|   | Engineer: SH           | Project #: EEV-24-0628                      |  |
|   | PER: 9361              | Page #: Page 16 of 39                       |  |

**5/16" Lag Screw into Mixed Maple-Southern Pine w/ 0 in. of Gap Space.**

**Base Plate Installation**

Calculations herein are performed in accordance with the National Design Specification for Wood Construction - 2018, Chapter 12.3 and Technical Report 12- General Dowel Equations for Calculating Lateral Connection Values, published by the American Wood Council

|                           |        |   |
|---------------------------|--------|---|
| Wood Screw Type=          | 5/16"  | Lag Screw   |
| Wood Screw Length=        | 2.00   | in  |
| Wood Screw Embedment=     | 1.50   | in  |
| Wood Screw Thread Length= | 1.50   | in  |
| D =                       | 0.313  | in , Dowel Diameter                               |
| D <sub>m</sub> =          | 0.227  | in , Dowel Diameter at max. stress in main member |
| D <sub>s</sub> =          | 0.227  | in , Dowel Diameter at max. stress in side member |
| F <sub>b</sub> =          | 60,000 | psi , Dowel bending strength                      |

**Wood Screw Withdrawal Calculations**

|  |                           |
|--|---------------------------|
| Substrate:                                   | Mixed Maple-Southern Pine |
| Tabulated withdrawal design value:           | W = 306 lbs               |
| Penetration Factor:                          | C <sub>p</sub> = 1.50 in  |
| Duration Factor:                             | C <sub>d</sub> = 1.60     |
| <b>Withdrawal Allowable (W') = 734.0 lbs</b> |                           |

**Wood Screw Lateral Calculations - Solid Main Member - Solid Side Member**

|                          |   |
|--------------------------|---|
| Substrate (Main Member): | Mixed Maple-Southern Pine   |
| Frame (Side Member):     | Aluminum 6063-T6  |
| Cantilever Distance:     | 0 in , Frame hollow space+ shim   |
| ℓ <sub>m</sub> =         | 1.500 in , Main member dowel bearing length   |
| ℓ <sub>s</sub> =         | 0.433 in , Side member dowel bearing length   |
| F <sub>em</sub> =        | 4,586 psi , Main member dowel bearing strength  |
| F <sub>es</sub> =        | 35,000 psi , Side member dowel bearing strength   |
| q <sub>m</sub> =         | 1,041 lbs/in , Main member dowel bearing resistance = F <sub>em</sub> D <sub>m</sub>                  |
| q <sub>s</sub> =         | 7,945 lbs/in , Side member dowel bearing resistance = F <sub>es</sub> D <sub>s</sub>                  |
| M <sub>m</sub> =         | 116.97 in-lbs , Main member dowel moment resistance = F <sub>b</sub> (D <sub>m</sub> <sup>3</sup> /6) |
| M <sub>s</sub> =         | 116.97 in-lbs , Side member dowel moment resistance = F <sub>b</sub> (D <sub>s</sub> <sup>3</sup> /6) |
| θ =                      | 90 degrees , Maximum angle of load to grain (0° ≤ θ ≤ 90°) for any member in a connection             |
| K <sub>θ</sub> =         | 1.25  |
| K <sub>D</sub> =         | 2.770   |

|   |                        |   |  |
|---|------------------------|---|--|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |  |
|   | Engineer: SH           | Project #: EEV-24-0628                      |  |
|   | PER: 9361              | Page #: Page 17 of 39                       |  |



**5/16" Lag Screw into Mixed Maple-Southern Pine w/ 0 in. of Gap Space.**  
**Base Plate Installation**

Yield Limit Equations per Table 11.3.1A of ANSI/AWC NDS-2018 and Table 1-1 of Technical Report 12 from AWC

|                             |                       | Single Shear  |            | Double Shear   |            |   |
|-----------------------------|-----------------------|---------------|------------|----------------|------------|---|
| Mode I <sub>m</sub>         | Z <sub>F</sub>        | 1561.52       | lbs        | 1561.52        | lbs        | , Main Member Bearing                                       |
|                             |                       |               |            | 5.00           |            | , Reduction Term  |
| <b>Mode I<sub>m</sub></b>   | <b>Z<sub>F</sub></b>  | <b>312.30</b> | <b>lbs</b> | <b>312.30</b>  | <b>lbs</b> |   |
| Mode I <sub>s</sub>         | Z <sub>F</sub>        | 3440.19       | lbs        | 6880.37        | lbs        | , Side Member Bearing                                       |
|                             |                       |               |            | 5.00           |            | , Reduction Term  |
| <b>Mode I<sub>s</sub></b>   | <b>Z<sub>F</sub></b>  | <b>688.04</b> | <b>lbs</b> | <b>1376.07</b> | <b>lbs</b> |   |
| Mode II                     | Z <sub>IF</sub>       | 807.79        | lbs        |                |            | , Side and Main Member Bearing                              |
|                             | A =                   | 0.0003        |            |                |            |   |
|                             | B =                   | 0.967         |            |                |            |   |
|                             | C =                   | -957.97       |            |                |            |   |
|                             |                       |               |            | 4.50           |            | , Reduction Term  |
| <b>Mode II</b>              | <b>Z<sub>IF</sub></b> | <b>179.51</b> | <b>lbs</b> |                |            |   |
| Mode III <sub>m</sub>       | Z <sub>IF</sub>       | 724.57        | lbs        |                |            | , Main Member Bearing and Dowel Yielding in the Side Member |
|                             | A =                   | 0.0003        |            |                |            |   |
|                             | B =                   | 0.750         |            |                |            |   |
|                             | C =                   | -702.54       |            |                |            |   |
|                             |                       |               |            | 4.00           |            | , Reduction Term  |
| <b>Mode III<sub>m</sub></b> | <b>Z<sub>IF</sub></b> | <b>181.14</b> | <b>lbs</b> |                |            |   |
| Mode III <sub>s</sub>       | Z <sub>IF</sub>       | 788.97        | lbs        | 1577.93        | lbs        | , Side Member Bearing and Dowel Yielding in the Main Member |
|                             | A =                   | 0.0005        |            |                |            |   |
|                             | B =                   | 0.217         |            |                |            |   |
|                             | C =                   | -489.37       |            |                |            |   |
|                             |                       |               |            | 4.00           |            | , Reduction Term  |
| <b>Mode III<sub>s</sub></b> | <b>Z<sub>IF</sub></b> | <b>197.24</b> | <b>lbs</b> | <b>394.48</b>  | <b>lbs</b> |   |
| Mode IV                     | Z <sub>IF</sub>       | 656.24        | lbs        | 1312.47        | lbs        | , Dowel Yielding in the Side and Main Member                |
|                             | A =                   | 0.0005        |            |                |            |   |
|                             | B =                   | 0.000         |            |                |            |   |
|                             | C =                   | -233.94       |            |                |            |   |
|                             |                       |               |            | 4.00           |            | , Reduction Term  |
| <b>Mode IV</b>              | <b>Z<sub>IF</sub></b> | <b>164.06</b> | <b>lbs</b> | <b>328.12</b>  | <b>lbs</b> |   |

C<sub>d</sub> = 1.6 , Load Duration

C<sub>p</sub> = 1.000 , Penetration Factor

**Single Lateral Allowable (Z'<sub>s</sub>) = 262.495 lbs**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 18 of 39 |

**3/8" Lag Screw into Mixed Maple-Southern Pine w/0 in. of Gap Space.**

**Base Plate Installation**

Calculations herein are performed in accordance with the National Design Specification for Wood Construction - 2018, Chapter 12.3 and Technical Report 12- General Dowel Equations for Calculating Lateral Connection Values, published by the American Wood Council

|                           |        |   |
|---------------------------|--------|---|
| Wood Screw Type=          | 3/8"   | Lag Screw   |
| Wood Screw Length=        | 2.00   | in  |
| Wood Screw Embedment=     | 1.50   | in  |
| Wood Screw Thread Length= | 1.50   | in  |
| D =                       | 0.375  | in , Dowel Diameter                               |
| D <sub>m</sub> =          | 0.265  | in , Dowel Diameter at max. stress in main member |
| D <sub>s</sub> =          | 0.265  | in , Dowel Diameter at max. stress in side member |
| F <sub>b</sub> =          | 45,000 | psi , Dowel bending strength                      |

**Wood Screw Withdrawal Calculations**

|  |                           |
|--|---------------------------|
| Substrate:                                   | Mixed Maple-Southern Pine |
| Tabulated withdrawal design value:           | W = 351 lbs               |
| Penetration Factor:                          | C <sub>p</sub> = 1.50 in  |
| Duration Factor:                             | C <sub>d</sub> = 1.60     |
| <b>Withdrawal Allowable (W') = 842.0 lbs</b> |                           |

**Wood Screw Lateral Calculations - Solid Main Member - Solid Side Member**

|                          |   |
|--------------------------|---|
| Substrate (Main Member): | Mixed Maple-Southern Pine   |
| Frame (Side Member):     | Aluminum 6063-T6  |
| Cantilever Distance:     | 0 in , Frame hollow space+ shim   |
| ℓ <sub>m</sub> =         | 1.500 in , Main member dowel bearing length   |
| ℓ <sub>s</sub> =         | 0.438 in , Side member dowel bearing length   |
| F <sub>em</sub> =        | 4,186 psi , Main member dowel bearing strength  |
| F <sub>es</sub> =        | 35,000 psi , Side member dowel bearing strength   |
| q <sub>m</sub> =         | 1,109 lbs/in , Main member dowel bearing resistance = F <sub>em</sub> D <sub>m</sub>                  |
| q <sub>s</sub> =         | 9,275 lbs/in , Side member dowel bearing resistance = F <sub>es</sub> D <sub>s</sub>                  |
| M <sub>m</sub> =         | 139.57 in-lbs , Main member dowel moment resistance = F <sub>b</sub> (D <sub>m</sub> <sup>3</sup> /6) |
| M <sub>s</sub> =         | 139.57 in-lbs , Side member dowel moment resistance = F <sub>b</sub> (D <sub>s</sub> <sup>3</sup> /6) |
| θ =                      | 90 degrees , Maximum angle of load to grain (0° ≤ θ ≤ 90°) for any member in a connection             |
| K <sub>θ</sub> =         | 1.25  |
| K <sub>D</sub> =         | N/A   |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 19 of 39 |



**3/8" Lag Screw into Mixed Maple-Southern Pine w/ 0 in. of Gap Space.  
 Base Plate Installation**

Yield Limit Equations per Table 11.3.1A of ANSI/AWC NDS-2018 and Table 1-1 of Technical Report 12 from AWC

|                             |                       | Single Shear  |            | Double Shear   |            |  |
|-----------------------------|-----------------------|---------------|------------|----------------|------------|--|
| Mode I <sub>m</sub>         | Z <sub>F</sub>        | 1664.09       | lbs        | 1664.09        | lbs        | , Main Member Bearing<br>, Reduction Term                      |
| <b>Mode I<sub>m</sub></b>   | <b>Z<sub>F</sub></b>  | <b>332.82</b> | <b>lbs</b> | <b>332.82</b>  | <b>lbs</b> |  |
| Mode I <sub>s</sub>         | Z <sub>F</sub>        | 4016.08       | lbs        | 8032.15        | lbs        | , Side Member Bearing<br>, Reduction Term                      |
| <b>Mode I<sub>s</sub></b>   | <b>Z<sub>F</sub></b>  | <b>803.22</b> | <b>lbs</b> | <b>1606.43</b> | <b>lbs</b> |  |
| Mode II                     | Z <sub>F</sub>        | 889.11        | lbs        |                |            | , Side and Main Member Bearing                                 |
|                             | A =                   | 0.0003        |            |                |            |  |
|                             | B =                   | 0.967         |            |                |            |  |
|                             | C =                   | -1058.77      |            |                |            |  |
|                             |                       |               |            | 4.50           |            | , Reduction Term   |
| <b>Mode II</b>              | <b>Z<sub>F</sub></b>  | <b>197.58</b> | <b>lbs</b> |                |            |  |
| Mode III <sub>m</sub>       | Z <sub>II</sub>       | 787.33        | lbs        |                |            | , Main Member Bearing and Dowel<br>Yielding in the Side Member |
|                             | A =                   | 0.0003        |            |                |            |  |
|                             | B =                   | 0.750         |            |                |            |  |
|                             | C =                   | -763.61       |            |                |            |  |
|                             |                       |               |            | 4.00           |            | , Reduction Term   |
| <b>Mode III<sub>m</sub></b> | <b>Z<sub>II</sub></b> | <b>196.83</b> | <b>lbs</b> |                |            |  |
| Mode III <sub>s</sub>       | Z <sub>II</sub>       | 898.07        | lbs        | 1786.14        | lbs        | , Side Member Bearing and Dowel<br>Yielding in the Main Member |
|                             | A =                   | 0.0005        |            |                |            |  |
|                             | B =                   | 0.217         |            |                |            |  |
|                             | C =                   | -574.31       |            |                |            |  |
|                             |                       |               |            | 4.00           |            | , Reduction Term   |
| <b>Mode III<sub>s</sub></b> | <b>Z<sub>II</sub></b> | <b>223.27</b> | <b>lbs</b> | <b>446.54</b>  | <b>lbs</b> |  |
| Mode IV                     | Z <sub>V</sub>        | 743.77        | lbs        | 1487.54        | lbs        | , Dowel Yielding in the Side and Main<br>Member                |
|                             | A =                   | 0.0005        |            |                |            |  |
|                             | B =                   | 0.000         |            |                |            |  |
|                             | C =                   | -279.14       |            |                |            |  |
|                             |                       |               |            | 4.00           |            | , Reduction Term   |
| <b>Mode IV</b>              | <b>Z<sub>V</sub></b>  | <b>185.94</b> | <b>lbs</b> | <b>371.89</b>  | <b>lbs</b> |  |

C<sub>d</sub> = 1.6 , Load Duration

C<sub>p</sub> = 1.000 , Penetration Factor

**Single Lateral Allowable (Z'<sub>s</sub>) = 297.508 lbs**

|  |                        |   |                       |
|--|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass<br>Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|  |                        | Project #: EEV-24-0628                      |                       |
|  | Engineer: SH           | PER: 9361                                   | Page #: Page 20 of 39 |

**1/2" Lag Screw into Mixed Maple-Southern Pine w/ 0 in. of Gap Space.**

**Base Plate Installation**

Calculations herein are performed in accordance with the National Design Specification for Wood Construction - 2018, Chapter 12.3 and Technical Report 12- General Dowel Equations for Calculating Lateral Connection Values, published by the American Wood Council

Wood Screw Type= 1/2" Lag Screw  
 Wood Screw Length= 2.00 in  
 Wood Screw Embedment= 1.50 in  
 Wood Screw Thread Length= 1.50 in  
 D = 0.500 in , Dowel Diameter  
 D<sub>m</sub> = 0.371 in , Dowel Diameter at max. stress in main member  
 D<sub>s</sub> = 0.371 in , Dowel Diameter at max. stress in side member  
 F<sub>b</sub> = 45,000 psi , Dowel bending strength

**Wood Screw Withdrawal Calculations**

Substrate: Mixed Maple-Southern Pine  
 Tabulated withdrawal design value: W = 436 lbs  
 Penetration Factor: C<sub>p</sub> = 1.50 in  
 Duration Factor: C<sub>d</sub> = 1.60

**Withdrawal Allowable (W') = 1046.0 lbs**

**Wood Screw Lateral Calculations - Solid Main Member - Solid Side Member**

Substrate (Main Member): Mixed Maple-Southern Pine  
 Frame (Side Member): Aluminum 6063-T6  
 Cantilever Distance: 0 in , Frame hollow space+ shim  
 ℓ<sub>m</sub> = 1.500 in , Main member dowel bearing length  
 ℓ<sub>s</sub> = 0.438 in , Side member dowel bearing length  
 F<sub>em</sub> = 3,626 psi , Main member dowel bearing strength  
 F<sub>es</sub> = 35,000 psi , Side member dowel bearing strength  
 q<sub>m</sub> = 1,345 lbs/in , Main member dowel bearing resistance = F<sub>em</sub>D<sub>m</sub>  
 q<sub>s</sub> = 12,985 lbs/in , Side member dowel bearing resistance = F<sub>es</sub>D<sub>s</sub>  
 M<sub>m</sub> = 382.99 in-lbs , Main member dowel moment resistance = F<sub>b</sub>(D<sub>m</sub><sup>3</sup>/6)  
 M<sub>s</sub> = 382.99 in-lbs , Side member dowel moment resistance = F<sub>b</sub>(D<sub>s</sub><sup>3</sup>/6)  
 θ = 90 degrees , Maximum angle of load to grain (0° ≤ θ ≤ 90°) for any member in a connection  
 K<sub>θ</sub> = 1.25  
 K<sub>D</sub> = N/A

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 21 of 39 |



**1/2" Lag Screw into Mixed Maple-Southern Pine w/ 0 in. of Gap Space.**  
**Base Plate Installation**

Yield Limit Equations per Table 11.3.1A of ANSI/AWC NDS-2018 and Table 1-1 of Technical Report 12 from AWC

|                             |                       | Single Shear   |            | Double Shear   |            |                                       |
|-----------------------------|-----------------------|----------------|------------|----------------|------------|---------------------------------------|
| Mode I <sub>m</sub>         | Z <sub>F</sub>        | 2017.60        | lbs        | 2017.60        | lbs        | , Main Member Bearing                 |
|                             |                       |                |            | 5.00           |            | , Reduction Term                      |
| <b>Mode I<sub>m</sub></b>   | <b>Z<sub>F</sub></b>  | <b>403.52</b>  | <b>lbs</b> | <b>403.52</b>  | <b>lbs</b> |                                       |
| Mode I <sub>s</sub>         | Z <sub>F</sub>        | 5622.51        | lbs        | 11245.01       | lbs        | , Side Member Bearing                 |
|                             |                       |                |            | 5.00           |            | , Reduction Term                      |
| <b>Mode I<sub>s</sub></b>   | <b>Z<sub>F</sub></b>  | <b>1124.50</b> | <b>lbs</b> | <b>2249.00</b> | <b>lbs</b> |                                       |
| Mode II                     | Z <sub>F</sub>        | 1137.81        | lbs        |                |            | , Side and Main Member Bearing        |
|                             | A =                   | 0.0002         |            |                |            |                                       |
|                             | B =                   | 0.967          |            |                |            |                                       |
|                             | C =                   | -1365.24       |            |                |            |                                       |
|                             |                       |                |            | 4.50           |            | , Reduction Term                      |
| <b>Mode II</b>              | <b>Z<sub>F</sub></b>  | <b>252.85</b>  | <b>lbs</b> |                |            |                                       |
| Mode III <sub>m</sub>       | Z <sub>II</sub>       | 1134.44        | lbs        |                |            | , Main Member Bearing and Dowel       |
|                             | A =                   | 0.0002         |            |                |            | Yielding in the Side Member           |
|                             | B =                   | 0.750          |            |                |            |                                       |
|                             | C =                   | -1139.59       |            |                |            |                                       |
|                             |                       |                |            | 4.00           |            | , Reduction Term                      |
| <b>Mode III<sub>m</sub></b> | <b>Z<sub>II</sub></b> | <b>283.61</b>  | <b>lbs</b> |                |            |                                       |
| Mode III <sub>s</sub>       | Z <sub>II</sub>       | 1339.58        | lbs        | 2679.16        | lbs        | , Side Member Bearing and Dowel       |
|                             | A =                   | 0.0004         |            |                |            | Yielding in the Main Member           |
|                             | B =                   | 0.217          |            |                |            |                                       |
|                             | C =                   | -991.62        |            |                |            |                                       |
|                             |                       |                |            | 4.00           |            | , Reduction Term                      |
| <b>Mode III<sub>s</sub></b> | <b>Z<sub>II</sub></b> | <b>334.89</b>  | <b>lbs</b> | <b>669.79</b>  | <b>lbs</b> |                                       |
| Mode IV                     | Z <sub>V</sub>        | 1366.44        | lbs        | 2732.88        | lbs        | , Dowel Yielding in the Side and Main |
|                             | A =                   | 0.0004         |            |                |            | Member                                |
|                             | B =                   | 0.000          |            |                |            |                                       |
|                             | C =                   | -765.97        |            |                |            |                                       |
|                             |                       |                |            | 4.00           |            | , Reduction Term                      |
| <b>Mode IV</b>              | <b>Z<sub>V</sub></b>  | <b>341.61</b>  | <b>lbs</b> | <b>683.22</b>  | <b>lbs</b> |                                       |

C<sub>d</sub> = 1.6 , Load Duration

C<sub>p</sub> = 1.000 , Penetration Factor

**Single Lateral Allowable (Z'<sub>s</sub>) = 404.554 lbs**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 22 of 39 |

**E4.3.1 Shear Strength Limited by Tilting and Bearing: 5/16" Self-Tapping Screw**

Reference: AISI Cold Formed Steel Specifications, E4.3.1

The nominal shear strength [resistance] per screw,  $P_{ns}$ , shall be determined in accordance with this section.

For  $t_2/t_1 \leq 1.0$ ,  $P_{ns}$  shall be taken as the smallest of

$$P_{ns} = 4.2 (t_2^3 d)^{1/2} F_{u2} \quad (\text{Eq. E4.3.1-1})$$

$$P_{ns} = 2.7 t_1 d F_{u1} \quad (\text{Eq. E4.3.1-2})$$

$$P_{ns} = 2.7 t_2 d F_{u2} \quad (\text{Eq. E4.3.1-3})$$

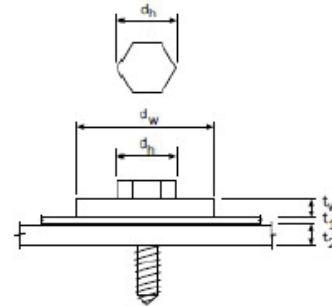
For  $t_2/t_1 \geq 2.5$ ,  $P_{ns}$  shall be taken as the smaller of

$$P_{ns} = 2.7 t_1 d F_{u1} \quad (\text{Eq. E4.3.1-4})$$

$$P_{ns} = 2.7 t_2 d F_{u2} \quad (\text{Eq. E4.3.1-5})$$

For  $1.0 < t_2/t_1 < 2.5$ ,  $P_{ns}$  shall be calculated by linear interpolation between the above two cases.

Figure 1: Typical Connection Detail



Where,

|  |                      |
|--|----------------------|
| Nominal screw diameter,                                  | $d = 0.3125$ in.     |
| Thickness of member in contact with screw head,          | $t_1 = 0.433$ in.    |
| Thickness of member not in contact with screw head,      | $t_2 = 0.125$ in.    |
| Ratio of thickness,                                      | $t_2/t_1 = 0.28868$  |
| Tensile strength of mem. in contact with screw head,     | $F_{u1} = 35000$ psi |
| Tensile strength of mem. not in contact with screw head, | $F_{u2} = 45000$ psi |

|               |                        |
|---------------|------------------------|
| Eq. E4.3.1-1, | $P_{ns} = 4669.3$ lbs  |
| Eq. E4.3.1-2, | $P_{ns} = 12787$ lbs   |
| Eq. E4.3.1-3, | $P_{ns} = 4746.09$ lbs |
| Eq. E4.3.1-4, | $P_{ns} = 12787$ lbs   |
| Eq. E4.3.1-5, | $P_{ns} = 4746.09$ lbs |

|                             |                        |                       |
|-----------------------------|------------------------|-----------------------|
| For $t_2/t_1 \leq 1.0$ ,    | $P_{ns} = 4669.3$ lbs  | <b>Use This Value</b> |
| For $t_2/t_1 \geq 2.5$ ,    | $P_{ns} = 4746.09$ lbs | <b>Not Applicable</b> |
| For $1.0 < t_2/t_1 < 2.5$ , | $P_{ns} = 4632.88$ lbs | <b>Not Applicable</b> |

|           |                                |              |
|-----------|--------------------------------|--------------|
| Per ASD,  | $P_{ns}/\Omega = 1556.43$ lbs, | $\Omega = 3$ |
| Per LRFD, | $\Phi P_{ns} = 2334.65$ lbs,   | $\Phi = 0.5$ |

**Check Shear Capacity of Screw.**

|                           |  |
|---------------------------|--|
| 5/16" Self Tapping Screw, | $D = 0.3125$ in.                           |
|                           | $P_n/\Omega = 1299$ lbs, per AAMATIR A9-14 |

**Check Combined Bending & Shear.**

|                  |                           |                               |                               |
|------------------|---------------------------|-------------------------------|-------------------------------|
| Nom. Diameter,   | $D = 0.313$ in.           | $S = 0.0030$ in. <sup>3</sup> | $A = 0.0767$ in. <sup>2</sup> |
| Screw Strength,  | $F_u = 120.0$ ksi         | $F_y = 92.0$ ksi              | $F_v = 27$ ksi                |
| Gap Screw,       | $g = 0.0$                 | $F_b = 45.0$ ksi              |                               |
| Eff. Cantilever, | $d = 0.00$ in.            |                               |                               |
| Allowable Load,  | $R_n/\Omega = 2070.9$ lbs | (based on unity equation)     |                               |

|   |                        |   |  |
|---|------------------------|---|--|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |  |
|   | Engineer: SH           | Project #: EEV-24-0628                      |  |
|   | PER: 9361              | Page #: Page 23 of 39                       |  |

**E4.4.1 Pull-Out Strength: 5/16" Self-Tapping Screw**

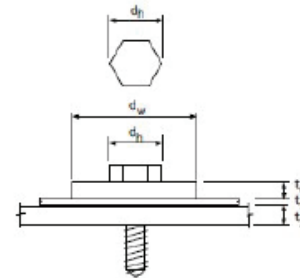
Reference: AISI Cold Formed Steel Specifications, E4.4.1

**E4.4.1 Pull-Out Strength [Resistance]**

The nominal pull-out strength [resistance],  $P_{not}$ , shall be calculated as follows:  
 $P_{not} = 0.85 t_c d F_{u2}$  (Eq. E4.4.1-1)

Same formula is referenced in AAMA TIR A9-14 for thickness of 1/4" or less.

Figure 1: Typical Connection Detail



Where,

Nominal screw diameter,

$d = 0.3125$  in.

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Thickness of member not in contact with screw head,

$t_2 = 0.125$  in.

Tensile strength of mem. not in contact with screw head,

$F_{u2} = 65000$  psi

Eq. E4.4.1

$P_{not} = 2158.2$  lbs

Per ASD,

$P_{ns}/\Omega = 719.401$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 1079.1$  lbs,  $\Phi = 0.5$

**E4.4.2 Pull-Over Strength**

Reference: AISI Cold Formed Steel Specifications, E4.4.2

$P_{nov} = 1.5 * t_1 * d'w * F_{u1}$  (Eq. E4.4.2-1)

Where,

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Tensile strength of mem. in contact with screw head,

$F_{u1} = 35000$  psi

Effective Pull-over Diameter,

$d'w = 0.625$  in.

Eq. E4.4.2-1

Per ASD,

$P_{ns}/\Omega = 4735.94$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 7103.91$  lbs,  $\Phi = 0.5$

**Check Tensile Capacity of Screw.**

5/16" Self Tapping Screw,

$D = 0.3125$  in.

$P_n/\Omega = 2517$  lbs, per AAMA TIR A9-14

**Design Value**

$T = 719.401$  lbs

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 24 of 39 |

**E4.3.1 Shear Strength Limited by Tilting and Bearing: 3/8" Self-Tapping Screw**

Reference: AISI Cold Formed Steel Specifications, E4.3.1

The nominal shear strength [resistance] per screw,  $P_{ns}$ , shall be determined in accordance with this section.

For  $t_2/t_1 \leq 1.0$ ,  $P_{ns}$  shall be taken as the smallest of

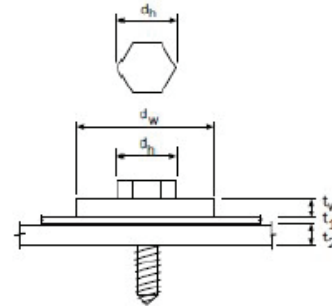
$P_{ns} = 4.2 (t_2^3 d)^{1/2} F_{u2}$  (Eq. E4.3.1-1)  
 $P_{ns} = 2.7 t_1 d F_{u1}$  (Eq. E4.3.1-2)  
 $P_{ns} = 2.7 t_2 d F_{u2}$  (Eq. E4.3.1-3)

For  $t_2/t_1 \geq 2.5$ ,  $P_{ns}$  shall be taken as the smaller of

$P_{ns} = 2.7 t_1 d F_{u1}$  (Eq. E4.3.1-4)  
 $P_{ns} = 2.7 t_2 d F_{u2}$  (Eq. E4.3.1-5)

For  $1.0 < t_2/t_1 < 2.5$ ,  $P_{ns}$  shall be calculated by linear interpolation between the above two cases.

Figure 1: Typical Connection Detail



Where,

|  |                      |
|--|----------------------|
| Nominal screw diameter,                                  | $d = 0.375$ in.      |
| Thickness of member in contact with screw head,          | $t_1 = 0.433$ in.    |
| Thickness of member not in contact with screw head,      | $t_2 = 0.125$ in.    |
| Ratio of thickness,                                      | $t_2/t_1 = 0.28868$  |
| Tensile strength of mem. in contact with screw head,     | $F_{u1} = 35000$ psi |
| Tensile strength of mem. not in contact with screw head, | $F_{u2} = 45000$ psi |

|               |                        |
|---------------|------------------------|
| Eq. E4.3.1-1, | $P_{ns} = 5114.96$ lbs |
| Eq. E4.3.1-2, | $P_{ns} = 15344.4$ lbs |
| Eq. E4.3.1-3, | $P_{ns} = 5695.31$ lbs |
| Eq. E4.3.1-4, | $P_{ns} = 15344.4$ lbs |
| Eq. E4.3.1-5, | $P_{ns} = 5695.31$ lbs |

|                             |                        |                       |
|-----------------------------|------------------------|-----------------------|
| For $t_2/t_1 \leq 1.0$ ,    | $P_{ns} = 5114.96$ lbs | <b>Use This Value</b> |
| For $t_2/t_1 \geq 2.5$ ,    | $P_{ns} = 5695.31$ lbs | <b>Not Applicable</b> |
| For $1.0 < t_2/t_1 < 2.5$ , | $P_{ns} = 4839.75$ lbs | <b>Not Applicable</b> |

|           |                                |              |
|-----------|--------------------------------|--------------|
| Per ASD,  | $P_{ns}/\Omega = 1704.99$ lbs, | $\Omega = 3$ |
| Per LRFD, | $\Phi P_{ns} = 2557.48$ lbs,   | $\Phi = 0.5$ |

**Check Shear Capacity of Screw.**

|                          |  |
|--------------------------|--|
| 3/8" Self Tapping Screw, | $D = 0.375$ in.                            |
|                          | $P_n/\Omega = 1937$ lbs, per AAMATIR A9-14 |

**Check Combined Bending & Shear.**

|                  |   |                               |                                |
|------------------|---|-------------------------------|--------------------------------|
| Nom. Diameter,   | $D = 0.375$ in.                                     | $S = 0.0052$ in. <sup>3</sup> | $A = 0.11045$ in. <sup>2</sup> |
| Screw Strength,  | $F_u = 120.0$ ksi                                   | $F_y = 92.0$ ksi              | $F_v = 27$ ksi                 |
| Gap Screw,       | $g = 0.0$   | $F_b = 45.0$ ksi              |                                |
| Eff. Cantilever, | $d = 0.00$ in.                                      |                               |                                |
| Allowable Load,  | $R_n/\Omega = 2982.1$ lbs (based on unity equation) |                               |                                |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 25 of 39 |

**E4.4.1 Pull-Out Strength: 3/8" Self-Tapping Screw**

Reference: AISI Cold Formed Steel Specifications, E4.4.1

**E4.4.1 Pull-Out Strength [Resistance]**

The nominal pull-out strength [resistance],  $P_{not}$ , shall be calculated as follows:  
 $P_{not} = 0.85 t_c d F_{u2}$  (Eq. E4.4.1-1)

Same formula is referenced in AAMA TIR A9-14 for thickness of 1/4" or less.

Figure 1: Typical Connection Detail



Where,

Nominal screw diameter,

$d = 0.375$  in.

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Thickness of member not in contact with screw head,

$t_2 = 0.125$  in.

Tensile strength of mem. not in contact with screw head,

$F_{u2} = 65000$  psi

Eq. E4.4.1

$P_{not} = 2589.84$  lbs

Per ASD,

$P_{ns}/\Omega = 863.281$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 1294.92$  lbs,  $\Phi = 0.5$

**E4.4.2 Pull-Over Strength**

Reference: AISI Cold Formed Steel Specifications, E4.4.2

$P_{nov} = 1.5 * t_1 * d_w * F_{u1}$  (Eq. E4.4.2-1)

Where,

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Tensile strength of mem. in contact with screw head,

$F_{u1} = 35000$  psi

Effective Pullover Diameter,

$d_w = 0.625$  in.

Eq. E4.4.2-1

Per ASD,

$P_{ns}/\Omega = 4735.94$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 7103.91$  lbs,  $\Phi = 0.5$

**Check Tensile Capacity of Screw.**

3/8" Self Tapping Screw,

$D = 0.375$  in.

$P_n/\Omega = 3719$  lbs, per AAMA TIR A9-14

**Design Value**

$T = 863.281$  lbs

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 26 of 39 |

**E4.3.1 Shear Strength Limited by Tilting and Bearing: 1/2" Self-Tapping Screw**

Reference: AISI Cold Formed Steel Specifications, E4.3.1

The nominal shear strength [resistance] per screw,  $P_{ns}$ , shall be determined in accordance with this section.

For  $t_2/t_1 \leq 1.0$ ,  $P_{ns}$  shall be taken as the smallest of

$P_{ns} = 4.2 (t_2^3 d)^{1/2} F_{u2}$  (Eq. E4.3.1-1)

$P_{ns} = 2.7 t_1 d F_{u1}$  (Eq. E4.3.1-2)

$P_{ns} = 2.7 t_2 d F_{u2}$  (Eq. E4.3.1-3)

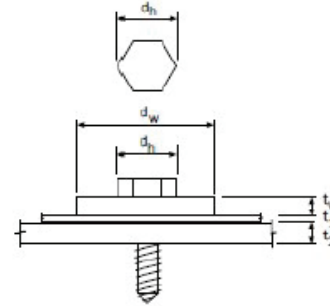
For  $t_2/t_1 \geq 2.5$ ,  $P_{ns}$  shall be taken as the smaller of

$P_{ns} = 2.7 t_1 d F_{u1}$  (Eq. E4.3.1-4)

$P_{ns} = 2.7 t_2 d F_{u2}$  (Eq. E4.3.1-5)

For  $1.0 < t_2/t_1 < 2.5$ ,  $P_{ns}$  shall be calculated by linear interpolation between the above two cases.

Figure 1: Typical Connection Detail



Where,

Nominal screw diameter,  $d = 0.5$  in.

Thickness of member in contact with screw head,  $t_1 = 0.433$  in.

Thickness of member not in contact with screw head,  $t_2 = 0.125$  in.

Ratio of thickness,  $t_2/t_1 = 0.28868$

Tensile strength of mem. in contact with screw head,  $F_{u1} = 35000$  psi

Tensile strength of mem. not in contact with screw head,  $F_{u2} = 45000$  psi

Eq. E4.3.1-1,  $P_{ns} = 5906.25$  lbs

Eq. E4.3.1-2,  $P_{ns} = 20459.3$  lbs

Eq. E4.3.1-3,  $P_{ns} = 7593.75$  lbs

Eq. E4.3.1-4,  $P_{ns} = 20459.3$  lbs

Eq. E4.3.1-5,  $P_{ns} = 7593.75$  lbs

For  $t_2/t_1 \leq 1.0$ ,  $P_{ns} = 5906.25$  lbs **Use This Value**

For  $t_2/t_1 \geq 2.5$ ,  $P_{ns} = 7593.75$  lbs **Not Applicable**

For  $1.0 < t_2/t_1 < 2.5$ ,  $P_{ns} = 5106.02$  lbs **Not Applicable**

Per ASD,  $P_{ns}/\Omega = 1968.75$  lbs,  $\Omega = 3$

Per LRFD,  $\Phi P_{ns} = 2953.13$  lbs,  $\Phi = 0.5$

**Check Shear Capacity of Screw.**

1/2" Self Tapping Screw,  $D = 0.5$  in.  
 $P_n/\Omega = 3581$  lbs, per AAMATIR A9-14

**Check Combined Bending & Shear.**

Nom. Diameter,  $D = 0.500$  in.  $S = 0.0123$  in.<sup>3</sup>  $A = 0.19635$  in.<sup>2</sup>

Screw Strength,  $F_u = 120.0$  ksi  $F_y = 92.0$  ksi  $F_v = 27$  ksi  $F_b = 45.0$  ksi

Gap Screw,  $g = 0.0$

Eff. Cantilever,  $d = 0.00$  in.

Allowable Load,  $R_n/\Omega = 5301.4$  lbs (based on unity equation)

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 27 of 39 |

**E4.4.1 Pull-Out Strength: 1/2" Self-Tapping Screw**

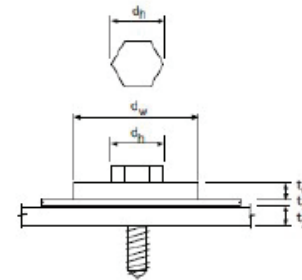
Reference: AISI Cold Formed Steel Specifications, E4.4.1

**E4.4.1 Pull-Out Strength [Resistance]**

The nominal pull-out strength [resistance],  $P_{not}$ , shall be calculated as follows:  
 $P_{not} = 0.85 t_c d F_{u2}$  (Eq. E4.4.1-1)

Same formula is referenced in AAMA TIR A9-14 for thickness of 1/4" or less.

Figure 1: Typical Connection Detail



Where,

Nominal screw diameter,

$d = 0.5$  in.

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Thickness of member not in contact with screw head,

$t_2 = 0.125$  in.

Tensile strength of mem. not in contact with screw head,

$F_{u2} = 65000$  psi

Eq. E4.4.1

$P_{not} = 3453.13$  lbs

Per ASD,

$P_{ns}/\Omega = 1151.04$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 1726.56$  lbs,  $\Phi = 0.5$

**E4.4.2 Pull-Over Strength**

Reference: AISI Cold Formed Steel Specifications, E4.4.2

$P_{nov} = 1.5 * t_1 * d_w * F_{u1}$  (Eq. E4.4.2-1)

Where,

Thickness of member in contact with screw head,

$t_1 = 0.433$  in.

Tensile strength of mem. in contact with screw head,

$F_{u1} = 35000$  psi

Effective Pull-over Diameter,

$d_w = 0.625$  in.

Eq. E4.4.2-1

Per ASD,

$P_{ns}/\Omega = 4735.94$  lbs,  $\Omega = 3$

Per LRFD,

$\Phi P_{ns} = 7103.91$  lbs,  $\Phi = 0.5$

**Check Tensile Capacity of Screw.**

1/2" Self Tapping Screw,

$D = 0.5$  in.

$P_n/\Omega = 6811$  lbs, per AAMA TIR A9-14

**Design Value**

$T = 1151.04$  lbs

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 28 of 39 |



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| Product Evaluation Report   |  |  |  |
|---|--|--|--|
| <b>Manufacture: Glass Warehouse</b><br><b>Product: Fabrikasi Posted Glass Railing</b>   |  |  |  |
| Tension Design Value  |  |  |  |
| Concrete Anchor Calculations  |  | Masonry Anchor Calculations  |  |
| Fastener type: 1/4" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: 3000 PSI Concrete or Greater<br>Minimum embedment: 2.50 in<br>Minimum Spacing: 3.00 in<br>Minimum edge distance: 3.00 in<br>Allowable Design Value: <b>W</b> = 647 lbs / anchor  |  | Fastener type: 1/4" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: Hollow Block CMU (Per ASTM C-90)<br>Minimum embedment: - in<br>Minimum Spacing: - in<br>Minimum edge distance: - in<br>Allowable Design Value: <b>W'</b> = - lbs / anchor |  |
| Shear Design Value  |  |  |  |
| Concrete Anchor Calculations  |  | Masonry Anchor Calculations  |  |
| Fastener type: 1/4" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: 3000 PSI Concrete or Greater<br>Minimum embedment: 2.50 in<br>Minimum Spacing: 3.00 in<br>Minimum edge distance: 3.00 in<br>Allowable Design Value: <b>Z'</b> = 375 lbs / anchor |  | Fastener type: 1/4" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: Hollow Block CMU (Per ASTM C-90)<br>Minimum embedment: - in<br>Minimum Spacing: - in<br>Minimum edge distance: - in<br>Allowable Design Value: <b>Z'</b> = - lbs / anchor |  |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      | Page #: Page 29 of 39 |
|   | PER: 9361              |   |                       |



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| <b>Product Evaluation Report</b>                      |  |  |  |
|---|--|--|--|
| <b>Manufacture: Glass Warehouse</b>                   |  |  |  |
| <b>Product: Fabrikasi Posted Glass Railing</b>        |  |  |  |
| Tension Design Value                                  |  |  |  |
| Concrete Anchor Calculations                          |  | Masonry Anchor Calculations                        |  |
| Fastener type: 3/8" Dewalt Screw-Bolt+                | Reference: Manufacturer Published Data | Fastener type: 3/8" Dewalt Screw-Bolt+             | Reference: Manufacturer Published Data |
| Substrate: 3000 PSI Concrete or Greater               |  | Substrate: Hollow Block CMU (Per ASTM C-90)        |  |
| Minimum embedment: 2.50 in                            |  | Minimum embedment: - in                            |  |
| Minimum Spacing: 3.00 in                              |  | Minimum Spacing: - in                              |  |
| Minimum edge distance: 3.00 in                        |  | Minimum edge distance: - in                        |  |
| Allowable Design Value: <b>W'</b> = 1041 lbs / anchor |  | Allowable Design Value: <b>W'</b> = - lbs / anchor |  |
| Shear Design Value                                    |  |  |  |
| Concrete Anchor Calculations                          |  | Masonry Anchor Calculations                        |  |
| Fastener type: 3/8" Dewalt Screw-Bolt+                | Reference: Manufacturer Published Data | Fastener type: 3/8" Dewalt Screw-Bolt+             | Reference: Manufacturer Published Data |
| Substrate: 3000 PSI Concrete or Greater               |  | Substrate: Hollow Block CMU (Per ASTM C-90)        |  |
| Minimum embedment: 2.50 in                            |  | Minimum embedment: - in                            |  |
| Minimum Spacing: 3.00 in                              |  | Minimum Spacing: - in                              |  |
| Minimum edge distance: 3.00 in                        |  | Minimum edge distance: - in                        |  |
| Allowable Design Value: <b>Z'</b> = 575 lbs / anchor  |  | Allowable Design Value: <b>Z'</b> = - lbs / anchor |  |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 30 of 39 |



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| Product Evaluation Report  |  |
|--|--|
| <b>Manufacture:</b> Glass Warehouse<br><b>Product:</b> Fabrikasi Posted Glass Railing  |  |
| Tension Design Value   |  |
| Concrete Anchor Calculations   | Masonry Anchor Calculations  |
| Fastener type: 1/2" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: 3000 PSI Concrete or Greater<br>Minimum embedment: 2.50 in<br>Minimum Spacing: 3.00 in<br>Minimum edge distance: 3.00 in<br>Allowable Design Value: <b>W' = 1347 lbs / anchor</b> | Fastener type: 1/2" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: Hollow Block CMU (Per ASTM C-90)<br>Minimum embedment: - in<br>Minimum Spacing: - in<br>Minimum edge distance: - in<br>Allowable Design Value: <b>W' = - lbs / anchor</b> |
| Shear Design Value   |  |
| Concrete Anchor Calculations   | Masonry Anchor Calculations  |
| Fastener type: 1/2" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: 3000 PSI Concrete or Greater<br>Minimum embedment: 2.50 in<br>Minimum Spacing: 3.00 in<br>Minimum edge distance: 3.00 in<br>Allowable Design Value: <b>Z' = 700 lbs / anchor</b>  | Fastener type: 1/2" Dewalt Screw-Bolt+<br>Reference: Manufacturer Published Data<br>Substrate: Hollow Block CMU (Per ASTM C-90)<br>Minimum embedment: - in<br>Minimum Spacing: - in<br>Minimum edge distance: - in<br>Allowable Design Value: <b>Z' = - lbs / anchor</b> |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 31 of 39 |



## Product Evaluation Report

**Manufacture:** Glass Warehouse  
**Product:** Fabrikasi Posted Glass Railing

### Manufacturer Published Data

#### Allowable Load Capacities for Screw-Bolt+ in Normal-Weight Concrete<sup>1,2,3,4,5</sup>



| Nominal Anchor Diameter in. | Minimum Nominal Embedment Depth in. (mm) | Minimum Concrete Compressive Strength |                |                                       |                |                                       |                |                                       |                |                                       |                |
|-----------------------------|--|---------------------------------------|----------------|---------------------------------------|----------------|---------------------------------------|----------------|---------------------------------------|----------------|---------------------------------------|----------------|
|                             |  | F <sub>c</sub> = 2,500 psi (17.3 MPa) |                | F <sub>c</sub> = 3,000 psi (20.7 MPa) |                | F <sub>c</sub> = 4,000 psi (27.6 MPa) |                | F <sub>c</sub> = 6,000 psi (41.4 MPa) |                | F <sub>c</sub> = 8,000 psi (55.2 MPa) |                |
|                             |  | Tension lbs (kN)                      | Shear lbs (kN) | Tension lbs (kN)                      | Shear lbs (kN) | Tension lbs (kN)                      | Shear lbs (kN) | Tension lbs (kN)                      | Shear lbs (kN) | Tension lbs (kN)                      | Shear lbs (kN) |
| 1/4                         | 1 (25)                                   | 330 (1.5)                             | 415 (1.8)      | 350 (1.6)                             | 440 (2.0)      | 385 (1.7)                             | 480 (2.1)      | 430 (1.9)                             | 520 (2.3)      | 430 (1.9)                             | 520 (2.3)      |
|                             | 1-5/8 (41)                               | 710 (3.2)                             | 415 (1.8)      | 750 (3.3)                             | 440 (2.0)      | 815 (3.6)                             | 480 (2.1)      | 815 (3.6)                             | 520 (2.3)      | 815 (3.6)                             | 520 (2.3)      |
|                             | 2-1/2 (64)                               | 915 (4.1)                             | 505 (2.2)      | 965 (4.3)                             | 535 (2.4)      | 1,050 (4.7)                           | 585 (2.6)      | 1,070 (4.8)                           | 635 (2.8)      | 1,070 (4.8)                           | 635 (2.8)      |
| 3/8                         | 1-1/2 (38)                               | 660 (2.9)                             | 890 (4.0)      | 720 (3.2)                             | 975 (4.3)      | 835 (3.7)                             | 1,125 (5.0)    | 1,020 (4.5)                           | 1,375 (6.1)    | 1,020 (4.5)                           | 1,590 (7.1)    |
|                             | 2 (51)                                   | 920 (4.1)                             | 1,080 (4.8)    | 1,005 (4.5)                           | 1,185 (5.3)    | 1,160 (5.2)                           | 1,365 (6.1)    | 1,180 (5.2)                           | 1,585 (7.1)    | 1,365 (6.1)                           | 1,585 (7.1)    |
|                             | 2-1/2 (64)                               | 1,295 (5.8)                           | 1,080 (4.8)    | 1,415 (6.3)                           | 1,185 (5.3)    | 1,600 (7.1)                           | 1,365 (6.1)    | 1,815 (7.2)                           | 1,585 (7.1)    | 1,855 (8.3)                           | 1,585 (7.1)    |
|                             | 3-1/4 (83)                               | 1,855 (8.3)                           | 1,580 (7.0)    | 2,035 (9.1)                           | 1,735 (7.7)    | 2,265 (10.1)                          | 2,000 (8.9)    | 2,265 (10.1)                          | 2,140 (9.5)    | 2,590 (11.5)                          | 2,140 (9.5)    |
|                             | 4-1/2 (114)                              | 2,725 (12.1)                          | 1,580 (7.0)    | 2,985 (13.3)                          | 1,735 (7.7)    | 3,450 (15.3)                          | 2,000 (8.9)    | 3,770 (16.8)                          | 2,140 (9.5)    | 3,770 (16.8)                          | 2,140 (9.5)    |
| 1/2                         | 1-3/4 (44)                               | 710 (3.2)                             | 1,495 (6.7)    | 780 (3.5)                             | 1,640 (7.3)    | 900 (4.0)                             | 1,895 (8.4)    | 1,100 (4.9)                           | 2,320 (10.3)   | 1,100 (4.9)                           | 2,675 (11.9)   |
|                             | 2-1/2 (64)                               | 1,670 (7.4)                           | 2,010 (8.9)    | 1,830 (8.1)                           | 2,200 (9.8)    | 2,115 (9.4)                           | 2,540 (11.3)   | 2,115 (9.4)                           | 2,885 (12.8)   | 2,115 (9.4)                           | 2,885 (12.8)   |
|                             | 3 (76)                                   | 2,140 (9.5)                           | 2,010 (8.9)    | 2,345 (10.4)                          | 2,200 (9.8)    | 2,690 (11.9)                          | 2,540 (11.3)   | 2,690 (11.9)                          | 2,885 (12.8)   | 2,690 (11.9)                          | 2,885 (12.8)   |
|                             | 4-1/4 (108)                              | 3,315 (14.7)                          | 2,350 (10.5)   | 3,630 (16.1)                          | 2,575 (11.5)   | 4,120 (18.3)                          | 2,970 (13.2)   | 4,120 (18.3)                          | 3,380 (15.0)   | 4,120 (18.3)                          | 3,380 (15.0)   |
|                             | 5-1/2 (140)                              | 3,935 (17.5)                          | 2,350 (10.5)   | 4,310 (19.2)                          | 2,575 (11.5)   | 4,975 (22.1)                          | 2,970 (13.2)   | 5,330 (23.7)                          | 3,380 (15.0)   | 5,330 (23.7)                          | 3,380 (15.0)   |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 32 of 39 |



**5/16" Monolithic Tempered Glass - Supported Only by Posts**

- Glass Thickness = 5/16 in
- Minimum Thickness = 0.292 in
- Average Thickness = 0.313 in
- Glass Temper = Fully Tempered:
- Glass Moment of Inertia = 0.025 in<sup>4</sup>
- Glass Section Modulus = 0.171 in<sup>3</sup>
- Glass MOR (Fr) = 24000 lbs/in<sup>2</sup>
- Glass Allowable Bearing Stress = 6000 lbs/in<sup>2</sup>
- Allowable Stress (Wind Load) = 9600 lbs/in<sup>2</sup>
- Glass MOE = 10400000 lbs/in<sup>2</sup>
- Allowable Moment Live Loads, M<sub>L</sub> = 1023.17 in-lb/ft
- Allowable Moment Wind Load, M<sub>w</sub> = 1637.07 in-lb/ft

$$W = M_{aw} * 8 / L^2$$

| Allowable Wind Load (PSF) - 5/16" Tempered Glass |       |       |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|-------|-------|
| Post Spacing (in.)                               |       |       |       |       |       |       |       |
| 36.0   | 42.0  | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 121.26   | 89.09 | 68.21 | 53.90 | 43.66 | 36.08 | 30.32 | 25.83 |

$$M_e = PL / (4 * H^0.8)$$

| Max. Post Spacing (in.) for 200lb Concentrated Load - 5/16" Tempered Glass |       |       |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|-------|-------|
| Glass Height (in.)   |       |       |       |       |       |       |       |
| 36.0   | 42.0  | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 49.28  | 55.75 | 62.03 | 68.16 | 74.16 | 80.03 | 85.80 | 91.48 |

| Max. Post Spacing (in.) for 50plf Live Load - 5/16" Tempered Glass |       |       |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|-------|-------|
| Glass Height (in.)   |       |       |       |       |       |       |       |
| 36.0   | 42.0  | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 68.78  | 73.15 | 77.17 | 80.89 | 84.37 | 87.65 | 90.76 | 94.44 |

| Allowable Wind Load Table (PSF) - 5/16" Tempered Glass |                    |       |       |       |       |       |       |      |
|--|--------------------|-------|-------|-------|-------|-------|-------|------|
| Glass Height (in.)                                     | Post Spacing (in.) |       |       |       |       |       |       |      |
|  | 36.0               | 42.0  | 48.0  | 54.0  | 60.0  | 66.0  | 72.0  | 78.0 |
| 36.0   | 121.26             | 89.09 | 68.21 | -     | -     | -     | -     | -    |
| 42.0   | 121.26             | 89.09 | 68.21 | 53.90 | -     | -     | -     | -    |
| 48.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | -     | -     | -    |
| 54.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | 36.08 | -     | -    |
| 60.0   | 121.26             | 89.09 | 68.21 | 53.90 | 43.66 | 36.08 | 30.32 | -    |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
|   |                        | PER: 9361                                   | Page #: Page 33 of 39 |



**3/8" Monolithic Tempered Glass - Supported Only by Posts**

- Glass Thickness = 3/8 in
- Minimum Thickness = 0.355 in
- Average Thickness = 0.375 in
- Glass Temper = Fully Tempered
- Glass Moment of Inertia = 0.045 in<sup>4</sup>
- Glass Section Modulus = 0.252 in<sup>3</sup>
- Glass MOR (Fr) = 24000 lbs/in<sup>2</sup>
- Glass Allowable Bearing Stress = 6000 lbs/in<sup>2</sup>
- Allowable Stress (Wind Load) = 9600 lbs/in<sup>2</sup>
- Glass MOE = 10400000 lbs/in<sup>2</sup>
- Allowable Moment Live Loads, M<sub>L</sub> = 1512.30 in-lb/ft
- Allowable Moment Wind Load, M<sub>w</sub> = 2419.68 in-lb/ft

$$W = M_{aw} * 8 / L^2$$

| Allowable Wind Load (PSF) - 3/8" Tempered Glass |        |        |       |       |       |       |       |
|---|--------|--------|-------|-------|-------|-------|-------|
| Post Spacing (in.)                              |        |        |       |       |       |       |       |
| 36.0  | 42.0   | 48.0   | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 179.24  | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |

$$M_e = PL / (4 * H^{0.8})$$

| Max. Post Spacing (in.) for 200lb Concentrated Load - 3/8" Tempered Glass |       |       |        |        |        |        |        |
|---|-------|-------|--------|--------|--------|--------|--------|
| Glass Height (in.)  |       |       |        |        |        |        |        |
| 36.0  | 42.0  | 48.0  | 54.0   | 60.0   | 66.0   | 72.0   | 78.0   |
| 72.84   | 82.40 | 91.69 | 100.75 | 109.61 | 118.29 | 126.82 | 135.21 |

| Max. Post Spacing (in.) for 50plf Live Load - 3/8" Tempered Glass |       |       |       |        |        |        |        |
|---|-------|-------|-------|--------|--------|--------|--------|
| Glass Height (in.)  |       |       |       |        |        |        |        |
| 36.0  | 42.0  | 48.0  | 54.0  | 60.0   | 66.0   | 72.0   | 78.0   |
| 83.62   | 88.93 | 93.82 | 98.34 | 102.56 | 106.56 | 110.33 | 114.84 |

| Allowable Wind Load Table (PSF) - 3/8" Tempered Glass |                    |        |        |       |       |       |       |       |
|---|--------------------|--------|--------|-------|-------|-------|-------|-------|
| Glass Height (in.)                                    | Post Spacing (in.) |        |        |       |       |       |       |       |
|   | 36.0               | 42.0   | 48.0   | 54.0  | 60.0  | 66.0  | 72.0  | 78.0  |
| 36.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | -     |
| 42.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 48.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 54.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |
| 60.0  | 179.24             | 131.68 | 100.82 | 79.66 | 64.52 | 53.33 | 44.81 | 38.18 |

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
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|   | Engineer: SH           | Project #: EEV-24-0628                      |                       |
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**1/2" Monolithic Tempered Glass - Supported Only by Posts**

- Glass Thickness = 1/2 in
- Minimum Thickness = 0.469042 in
- Average Thickness = 0.500 in
- Glass Temper = Fully Tempered:
- Glass Moment of Inertia = 0.103 in<sup>4</sup>
- Glass Section Modulus = 0.440 in<sup>3</sup>
- Glass MOR (Fr) = 24000 lbs/in<sup>2</sup>
- Glass Allowable Bearing Stress = 6000 lbs/in<sup>2</sup>
- Allowable Stress (Wind Load) = 9600 lbs/in<sup>2</sup>
- Glass MOE = 10400000 lbs/in<sup>2</sup>
- Allowable Moment Live Loads, M<sub>L</sub> = 2640.00 in-lb/ft
- Allowable Moment Wind Load, M<sub>w</sub> = 4224.01 in-lb/ft

$$W = M_a w * 8 / L^2$$

| Allowable Wind Load (PSF) - 1/2" Tempered Glass |        |        |        |        |       |       |       |
|---|--------|--------|--------|--------|-------|-------|-------|
| Post Spacing (in.)                              |        |        |        |        |       |       |       |
| 36.0  | 42.0   | 48.0   | 54.0   | 60.0   | 66.0  | 72.0  | 78.0  |
| 312.89  | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |

$$M_e = PL / (4 * H^{0.8})$$

| Max. Post Spacing (in.) for 200lb Concentrated Load - 1/2" Tempered Glass |        |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|
| Glass Height (in.)  |        |        |        |        |        |        |        |
| 36.0  | 42.0   | 48.0   | 54.0   | 60.0   | 66.0   | 72.0   | 78.0   |
| 127.15  | 143.84 | 160.06 | 175.88 | 191.34 | 206.50 | 221.39 | 236.03 |

| Max. Post Spacing (in.) for 50plf Live Load - 1/2" Tempered Glass |        |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|
| Glass Height (in.)  |        |        |        |        |        |        |        |
| 36.0  | 42.0   | 48.0   | 54.0   | 60.0   | 66.0   | 72.0   | 78.0   |
| 110.99  | 118.04 | 124.52 | 130.52 | 136.15 | 141.43 | 146.45 | 152.28 |

| Allowable Wind Load Table (PSF) - 1/2" Tempered Glass |                    |        |        |        |        |       |       |       |
|---|--------------------|--------|--------|--------|--------|-------|-------|-------|
| Glass Height (in.)                                    | Post Spacing (in.) |        |        |        |        |       |       |       |
|   | 36.0               | 42.0   | 48.0   | 54.0   | 60.0   | 66.0  | 72.0  | 78.0  |
| 36.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 42.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 48.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 54.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |
| 60.0  | 312.89             | 229.88 | 176.00 | 139.06 | 112.64 | 93.09 | 78.22 | 66.65 |

|   |                        |   |                       |
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**Effective Thickness of Laminated Glass: (ASTM E1300 APPENDIX X9)**

**3/16 + 0.06 PVB + 3/16 = 7/16 Laminated Glass**

Glass Ply 1 Nominal Thickness: 3/16 in  
 Glass Ply 2 Nominal Thickness: 3/16 in  
 Interlayer Type: PVB  
 Interlayer Complex Shear Modulus: 70 psi

Laminate Nominal Thickness: 7/16 in  
 Glass Temper: Fully Tempered:

Glass Ply 1 min. Thickness (h1): 0.18 in  
 Glass Ply 2 min. Thickness (h2): 0.18 in  
 Interlayer Thickness (hv): 0.060 in

Laminate Minimum Thickness (hs): 0.240 in  
 Ply 1 weighted Thickness (hs1): 0.120 in  
 Ply 2 weighted Thickness (hs2): 0.120 in

Glass Inertia (Is): 0.0052 in<sup>3</sup>

| Glass Dimension (in) | Shear Transfer Coefficient (Γ) | Effective Thickness for Deflection (hef,w) | Effective thickness for Bending (h1;ef,σ) | Effective thickness for Bending (h2;ef,σ) | Section Modulus (in <sup>3</sup> ) | Allowable Moment (WL) (in-lb/ft) | Allowable Moment (LL) (in-lb/ft) |
|----------------------|--------------------------------|--|---|---|------------------------------------|----------------------------------|----------------------------------|
| 36                   | 0.144                          | 0.274                                      | 0.310                                     | 0.310                                     | 0.1923                             | 1846.2                           | 1153.9                           |
| 42                   | 0.186                          | 0.285                                      | 0.322                                     | 0.322                                     | 0.2071                             | 1987.7                           | 1242.3                           |
| 48                   | 0.230                          | 0.296                                      | 0.332                                     | 0.332                                     | 0.2210                             | 2121.7                           | 1326.1                           |
| 54                   | 0.275                          | 0.306                                      | 0.342                                     | 0.342                                     | 0.2339                             | 2245.4                           | 1403.4                           |
| 60                   | 0.319                          | 0.316                                      | 0.350                                     | 0.350                                     | 0.2456                             | 2357.6                           | 1473.5                           |
| 66                   | 0.361                          | 0.324                                      | 0.358                                     | 0.358                                     | 0.2561                             | 2458.4                           | 1536.5                           |
| 72                   | 0.402                          | 0.332                                      | 0.364                                     | 0.364                                     | 0.2654                             | 2548.1                           | 1592.6                           |
| 78                   | 0.441                          | 0.339                                      | 0.370                                     | 0.370                                     | 0.2737                             | 2627.7                           | 1642.3                           |

**Allowable Stress (Fb<sub>WL</sub>): 9600.00 psi**

**Allowable Stress (Fb<sub>LL</sub>): 6000.00 psi**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 36 of 39 |



**Effective Thickness of Laminated Glass: (ASTM E1300 APPENDIX X9)**

**3/16 + 0.06 SGP + 3/16 = 7/16 Laminated Glass**

Glass Ply 1 Nominal Thickness: 3/16 in  
 Glass Ply 2 Nominal Thickness: 3/16 in  
 Interlayer Type: SGP  
 Interlayer Complex Shear Modulus: 1638.9 psi

Laminate Nominal Thickness: 7/16 in  
 Glass Temper: Fully Tempered:

Glass Ply 1 min. Thickness (h1): 0.18 in  
 Glass Ply 2 min. Thickness (h2): 0.18 in  
 Interlayer Thickness (hv): 0.060 in

Laminate Minimum Thickness (hs): 0.240 in  
 Ply 1 weighted Thickness (hs1): 0.120 in  
 Ply 2 weighted Thickness (hs2): 0.120 in

Glass Inertia (Is): 0.0052 in<sup>3</sup>

| Glass Dimension (in) | Shear Transfer Coefficient ( $\Gamma$ ) | Effective Thickness for Deflection (hef,w) | Effective thickness for Bending (h1;ef, $\sigma$ ) | Effective thickness for Bending (h2;ef, $\sigma$ ) | Section Modulus (in <sup>3</sup> ) | Allowable Moment (WL) (in-lb/ft) | Allowable Moment (LL) (in-lb/ft) |
|----------------------|---|--|--|--|------------------------------------|----------------------------------|----------------------------------|
| 36                   | 0.798                                   | 0.394                                      | 0.406  | 0.406  | 0.3301                             | 3168.6                           | 1980.4                           |
| 42                   | 0.843                                   | 0.400                                      | 0.410  | 0.410  | 0.3354                             | 3220.0                           | 2012.5                           |
| 48                   | 0.875                                   | 0.404                                      | 0.412  | 0.412  | 0.3391                             | 3254.9                           | 2034.3                           |
| 54                   | 0.899                                   | 0.407                                      | 0.413  | 0.413  | 0.3416                             | 3279.5                           | 2049.7                           |
| 60                   | 0.916                                   | 0.410                                      | 0.414  | 0.414  | 0.3435                             | 3297.5                           | 2060.9                           |
| 66                   | 0.930                                   | 0.411                                      | 0.415  | 0.415  | 0.3449                             | 3311.0                           | 2069.4                           |
| 72                   | 0.940                                   | 0.412                                      | 0.416  | 0.416  | 0.3460                             | 3321.4                           | 2075.9                           |
| 78                   | 0.949                                   | 0.413                                      | 0.416  | 0.416  | 0.3468                             | 3329.6                           | 2081.0                           |

**Allowable Stress (Fb<sub>WL</sub>): 9600.00 psi**

**Allowable Stress (Fb<sub>LL</sub>): 6000.00 psi**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 37 of 39 |



**Effective Thickness of Laminated Glass: (ASTM E1300 APPENDIX X9)**

**1/4 + 0.06 PVB + 1/4 = 9/16 Laminated Glass**

Glass Ply 1 Nominal Thickness: 1/4 in  
 Glass Ply 2 Nominal Thickness: 1/4 in  
 Interlayer Type: PVB  
 Interlayer Complex Shear Modulus: 70 psi

Laminate Nominal Thickness: 9/16 in  
 Glass Temper: Fully Tempered:

Glass Ply 1 min. Thickness (h1): 0.219 in  
 Glass Ply 2 min. Thickness (h2): 0.219 in  
 Interlayer Thickness (hv): 0.060 in

Laminate Minimum Thickness (hs): 0.279 in  
 Ply 1 weighted Thickness (hs1): 0.140 in  
 Ply 2 weighted Thickness (hs2): 0.140 in

Glass Inertia (Is): 0.0085 in<sup>3</sup>

| Glass Dimension (in) | Shear Transfer Coefficient ( $\Gamma$ ) | Effective Thickness for Deflection ( $h_{ef,w}$ ) | Effective thickness for Bending ( $h1;ef,\sigma$ ) | Effective thickness for Bending ( $h2;ef,\sigma$ ) | Section Modulus (in <sup>3</sup> ) | Allowable Moment (WL) (in-lb/ft) | Allowable Moment (LL) (in-lb/ft) |
|----------------------|---|---|--|--|------------------------------------|----------------------------------|----------------------------------|
| 36                   | 0.121                                   | 0.322   | 0.364  | 0.364  | 0.2645                             | 2539.2                           | 1587.0                           |
| 42                   | 0.158                                   | 0.334   | 0.376  | 0.376  | 0.2829                             | 2715.4                           | 1697.1                           |
| 48                   | 0.197                                   | 0.345   | 0.388  | 0.388  | 0.3007                             | 2886.8                           | 1804.2                           |
| 54                   | 0.237                                   | 0.356   | 0.399  | 0.399  | 0.3176                             | 3049.2                           | 1905.8                           |
| 60                   | 0.278                                   | 0.367   | 0.408  | 0.408  | 0.3334                             | 3200.3                           | 2000.2                           |
| 66                   | 0.317                                   | 0.377   | 0.417  | 0.417  | 0.3478                             | 3338.9                           | 2086.8                           |
| 72                   | 0.356                                   | 0.386   | 0.425  | 0.425  | 0.3609                             | 3464.9                           | 2165.5                           |
| 78                   | 0.394                                   | 0.394   | 0.432  | 0.432  | 0.3728                             | 3578.6                           | 2236.6                           |

**Allowable Stress (Fb<sub>WL</sub>): 9600.00 psi**

**Allowable Stress (Fb<sub>LL</sub>): 6000.00 psi**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 38 of 39 |



**Effective Thickness of Laminated Glass: (ASTM E1300 APPENDIX X9)**

**1/4 + 0.06 SGP + 1/4 = 9/16 Laminated Glass**

Glass Ply 1 Nominal Thickness: 1/4 in  
 Glass Ply 2 Nominal Thickness: 1/4 in  
 Interlayer Type: SGP  
 Interlayer Complex Shear Modulus: 1638.9 psi

Laminate Nominal Thickness: 9/16 in  
 Glass Temper: Fully Tempered:

Glass Ply 1 min. Thickness (h1): 0.219 in  
 Glass Ply 2 min. Thickness (h2): 0.219 in  
 Interlayer Thickness (hv): 0.060 in

Laminate Minimum Thickness (hs): 0.279 in  
 Ply 1 weighted Thickness (hs1): 0.140 in  
 Ply 2 weighted Thickness (hs2): 0.140 in

Glass Inertia (Is): 0.0085 in<sup>3</sup>

| Glass Dimension (in) | Shear Transfer Coefficient ( $\Gamma$ ) | Effective Thickness for Deflection ( $h_{ef,w}$ ) | Effective thickness for Bending ( $h_1; e_f, \sigma$ ) | Effective thickness for Bending ( $h_2; e_f, \sigma$ ) | Section Modulus (in <sup>3</sup> ) | Allowable Moment (WL) (in-lb/ft) | Allowable Moment (LL) (in-lb/ft) |
|----------------------|---|---|--|--|------------------------------------|----------------------------------|----------------------------------|
| 36                   | 0.764                                   | 0.463   | 0.479  | 0.479  | 0.4590                             | 4406.2                           | 2753.9                           |
| 42                   | 0.815                                   | 0.471   | 0.484  | 0.484  | 0.4677                             | 4490.2                           | 2806.4                           |
| 48                   | 0.852                                   | 0.476   | 0.487  | 0.487  | 0.4737                             | 4547.7                           | 2842.3                           |
| 54                   | 0.879                                   | 0.481   | 0.489  | 0.489  | 0.4780                             | 4588.6                           | 2867.9                           |
| 60                   | 0.900                                   | 0.484   | 0.490  | 0.490  | 0.4811                             | 4618.6                           | 2886.6                           |
| 66                   | 0.916                                   | 0.486   | 0.492  | 0.492  | 0.4835                             | 4641.3                           | 2900.8                           |
| 72                   | 0.928                                   | 0.488   | 0.493  | 0.493  | 0.4853                             | 4658.7                           | 2911.7                           |
| 78                   | 0.938                                   | 0.489   | 0.493  | 0.493  | 0.4867                             | 4672.5                           | 2920.3                           |

**Allowable Stress ( $F_{b,WL}$ ): 9600.00 psi**

**Allowable Stress ( $F_{b,LL}$ ): 6000.00 psi**

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| Project Description:<br>Glass Warehouse LLC / FutureGlass – Fabrikasi Posted Glass Railing System | Date: January 30, 2025 | Customer: Glass Warehouse LLC / FutureGlass |                       |
|   |                        | Project #: EEV-24-0628                      |                       |
|   | Engineer: SH           | PER: 9361                                   | Page #: Page 39 of 39 |