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DIVISION: 06—WOOD AND PLASTICS
Section: 06430—Wood Stairs and Railings

REPORT HOLDER:

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- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)

Properties evaluated:

- Means of egress
- Structural

2.0 USES

The Fusion Stair Balustrading System is used as handrails and guards for interior stairways, to satisfy means of egress requirements in IBC Sections 1009 and 1012, and IRC Sections R311.5.1 and R312; and strength requirements in IBC Section 1607.7. Under the IBC, handrails are limited to Group R-2 Occupancies, located within individual dwelling units and Group R-3 Occupancies.

3.0 DESCRIPTION**3.1 General:**

The Fusion Stair Balustrading System consists of handrails, base rails, newel posts, balusters, brackets, and connectors. Figure 1 illustrates the system. The wood components comply with specifications described in the approved quality control manual.

3.2 Handrails:

The 2-inch-diameter (54.5 mm) circular handrails are produced from solid clear hemlock or American red oak wood in 94¹/₂-, 142-, and 165-inch (2400, 3600, and 4200 mm) lengths.

3.3 Base Rails:

The base rails have a semicircular cross section and are produced from solid hemlock or American red oak wood with

a 1-inch (25.4 mm) radius, in 94¹/₂-, 142-, and 165-inch (2400, 3600, and 4200 mm) lengths.

3.4 Newel Posts:

The newel posts are formed from solid hemlock or American red oak wood. The upper portion is 2⁵/₁₆ inches (54.5 mm) in diameter and 31¹/₂ inches (800 mm) long. The newel post base is 3¹/₄ inches (82 mm) square and 12¹⁹/₃₂ to 20 inches (320 to 510 mm) long.

3.5 Balusters:

The balusters have a circular cross section and are formed from chromium-plated or gold effect-finish seamless mild steel tube complying with British Standard BS449 Grade 43 or 50C. The outside diameter is ³/₄ inch (19 mm), the wall thickness is 0.0265 inch (0.6 mm), and the length is 28¹¹/₃₂ or 33¹⁵/₃₂ inches (720 or 850 mm).

3.6 Baluster Brackets:

The baluster brackets are formed from acrylonitrile butadiene styrene (ABS) plastic and have steel inserts. Available in rake (38- to 45-degree) and straight (90-degree) styles, the brackets are 2⁵/₈ inches (68 mm) high, 2 inches (50 mm) wide, and ³/₄ inch (20 mm) thick.

3.7 Connectors:

The connectors are die-cast from ⁵/₆₄-inch-thick (2 mm) aluminum-zinc alloy complying with British Standard BS8118-1 and 8118-2 and have a chromium-plated or gold effect-finish. Types include bottom connectors, top connectors, intermediate connectors, landing connectors, horizontal turn connectors, wall connectors, and newel base connectors. The connectors have an appropriate diameter and built-in draft to receive handrail and newel post components.

3.8 Fasteners:

Fasteners are zinc-plated steel cap bolts with nuts and washers that are ¹/₄ inch (6.4 mm) in diameter by ³/₄ inch (19 mm) long and ¹/₂ inch (12.7 mm) in diameter by 6⁷/₈ inches long (175 mm); No. 8 wood screws in 2-inch (51 mm) lengths; and No. 6 [0.138 inch (3.5 mm) diameter] by 1¹/₂-inch-long (38 mm) chromium-plated or gold effect-finish steel wood screws.

4.0 INSTALLATION**4.1 General:**

Installations must comply with the applicable code, this report, and Richard Burbidge Ltd.'s published installation instructions.

4.2 Handrails:

Handrails constructed with the Fusion Stair Balustrading System must comply with Section 1009.11 of the IBC and Section R311.5.6 of the IRC. The Fusion Stair Balustrading System is to be used with stairways with pitches ranging from

38 degrees to 45 degrees from horizontal. The handrail shall be $35\frac{7}{16}$ inches (900 mm) above the stair nosing. Newel post bases must be placed at the top and bottom of each stairway run and are required to be spaced a maximum of 6 feet (1823 mm) horizontally along each straight run. Handrail extensions must comply with Section 1009.11.5 of the IBC. No. 8 by 2-inch-long (51 mm) bugle-head wood screws shall be used to fasten the newel base connectors to nominally 1-by lumber stair treads or flooring with a minimum specific gravity of 0.54. The base rails shall be mitered to fit and shall be placed between the newel post bases and attached to the base rail connectors with four No. 6 by $2\frac{1}{2}$ -inch-long (63 mm) wood screws.

The newel posts must be fastened to the newel base connectors using $\frac{1}{2}$ -inch-diameter (12.7 mm) bolts. The newel base connectors are prepared by drilling a $\frac{1}{2}$ -inch-diameter (12.7 mm) hole into the top, $4\frac{15}{16}$ inches (125 mm) deep. A $\frac{13}{16}$ -inch-diameter (20 mm) access hole must be drilled through the side of the base, intersecting the bottom of the bolt and extending $\frac{13}{16}$ inch (20 mm) beyond. The bolt must be inserted into the bolt hole and secured by a barrel stud, which is locked into place.

The newel base connector must be placed over the bolt and fastened by the nut and washer. The newel posts must be prepared by drilling a 1-inch-diameter-by-1-inch-deep (25 mm by 25 mm) hole in the bottom; and fastened to the connectors using two No. 6 wood screws. The bottom and intermediate newel posts must be cut to a height of $21\frac{1}{4}$ inches (540 mm).

To install the balusters, the baluster connectors must be inserted into the baluster ends and proper angle adjustments achieved when the balusters are placed between the handrail and baserail. Then, the connectors are fixed by inserting and tightening the screws into each end.

The top and bottom handrail connectors must be fastened to the newel posts. The bottom connector is fastened using two No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws. The top connector is placed over the top of the newel post without securing. The base rail is secured to the base connector with two No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws or to the staircase stringer with two No. 8 by 2-inch-long (51 mm) wood screws. The handrail is inserted into the top connector and adjusted to the proper height, parallel to the base rail. The top connectors are then fastened to the newel posts with No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws. After verification of the proper position of the handrails, the handrails are fastened to the top connectors with two No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws.

The first and last balusters are positioned vertically, adjacent to the newel posts, with a maximum gap of $3\frac{15}{16}$ inches (99 mm). Then, the baluster connectors are fastened to the top rail using two No. 6 by 1-inch-long (25 mm) wood screws. To determine the number of intermediate balusters, the length in inches (mm) between the first and last balusters must be divided by $5\frac{27}{32}$ inches (148 mm), and the result rounded up to the next whole number.

4.3 Guards:

Guards constructed with the Fusion Stair Balustrading System must comply with Section 1012 of the IBC and Section R312 of the IRC. The landing base rails are cut and mitered to fit. The landing baluster brackets are fastened to the landing balusters using two No. 6 by $1\frac{1}{2}$ -inch-long (38

mm) wood screws. The handrails are inserted loosely into the landing connector. To establish the required height as set forth in Section 1012.2 of the IBC or Section R312.1 of the IRC, the assembled landing baluster is placed on the base rail and the handrail is placed over this baluster. The top newel post is then cut to accept the landing connector. Newel post spacing is limited to a maximum of 6 feet (1830 mm) on center. Similarly, where the landing balustrade ends at a wall, the position of the wall connector is determined by placing an assembled landing baluster between the base rail and the handrail to the required height.

The handrail length is determined by positioning the landing connector on the top newel post, pushing the handrail into the wall connector, and cutting to length at the newel post. The landing handrail is then fitted and fastened to the landing connector with No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws and is fastened to the wall connector with No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws. The landing connector is repositioned and fastened to the newel post with two No. 6 by $1\frac{1}{2}$ -inch-long (38 mm) wood screws, and the wall connector is connected to the structural frame of the wall with fasteners complying with the applicable code for the wall construction.

To determine the number of landing balusters, the landing length is divided by $4\frac{19}{32}$ inches (117 mm), and the result is rounded up to the next whole number.

The landing base rail is fastened to the structural supports with No. 8 by 2-inch-long (51 mm) wood screws at every fourth baluster. The baluster brackets must be fastened to the base rail and handrail with No. 6 by $1\frac{3}{16}$ -inch-long (30.1 mm) wood screws.

5.0 CONDITIONS OF USE

The Fusion Stair Balustrading System described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The system shall be installed in accordance with the applicable code, this report, and Richard Burbidge Ltd.'s installation instructions. In the event of a conflict between the manufacturer's instructions and this report, this report shall govern.
- 5.2 Handrail installations are limited to Group R-3 Occupancies and within individual dwelling units of Group R-2 Occupancies.
- 5.3 The system components are manufactured at Whittington Road, Oswestry, Shropshire, United Kingdom, under a quality control program with inspections by VTT Technical Research Centre of Finland, Building and Transport (AA-607).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Handrails and Guards (AC273), dated October 2004.

7.0 IDENTIFICATION

Packages of system components are labeled with the Richard Burbidge Ltd. name and address, the product designation, the product code, the evaluation report number (ICC-ES ESR-1520), and the name of the inspection agency (VTT Technical Research Centre of Finland, Building and Transport).



FIGURE 1—FUSION STAIR BALUSTRADING SYSTEM



1
After drilling your newel base, attach the threaded bar through the base into the barrel nut.



2
Secure the newel base connector onto the newel base using the fixings provided. Repeat steps 1 and 2 for all newel bases.



3
Measure and fit the baserail (this process differs for closed or open string staircases, see full fitting instructions in newel base connector for details).



8
Begin fitting appropriate landing balustrading.



4
After measuring your post to the correct length, fit and secure the posts in place. Repeat for all newel posts.



5
Attach the handrail using the bottom connector.



6
Fit the handrail to the correct angle using the top connector on the top post.



Begin fitting the balusters.

FIGURE 2—FUSION STAIR BALUSTRADING SYSTEM INSTALLATION DETAILS