


Legacy report on the BOCA® National Building Code/1999
**DIVISION 05 – METALS
Section 05100 – Structural Metal Framing**
THE PORTLAND COLUMN

PORTLAND STONE WARE COMPANY, INC.
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EVALUATION SCOPE

Compliance with the following code:

BOCA National Building Code/1999

- Section 1912.2 Design
- Section 1912.6 Approvals
- Section 2203.1 Structural steel construction

DESCRIPTION
■ COLUMN

The Portland Column consists of 16 gauge tubular steel pipe filled with concrete and are used as structural members to transfer axial compressive loads, from steel or wood beams, to footings. The column is available in two sizes, 4 inch and 3 1/2 inch. The 4 inch diameter column is available in lengths of 6 to 14 feet. The 3 1/2 inch diameter column is available in lengths of 6 to 12 feet. The tubular steel pipe consists of low carbon steel which conforms to ASTM A500-84 with a minimum yield strength of 33,000 psi and an ultimate strength of 45,000 psi.

■ END PLATES

Steel top and bottom plates are provided with the columns for installation in the field. The plates are available in two types. One plate type consists of 10-gauge low carbon ASTM A569 steel and has two 1/4 inch diameter bolt holes, and four raised lugs, as shown in Figure 1 of this report. The lugs are located on the plates in such a manner as to fit around the circumference of the column once installed. The other plate type consists of ASTM A36 steel, has twelve 7/16 inch diameter holes drilled near the perimeter of the plate to facilitate connections, and has a 1 inch deep 11 gauge steel ring welded to the plate to fit the steel columns, as shown in Figure 2 of this report.

■ MANUFACTURE

The tubular steel pipe is filled with concrete which has a minimum 28-day compressive strength of 2500 psi, and which complies with ASTM C150 and AASHTO M-85. Once the concrete is poured the ends are smoothed. The columns are allowed to stand for a 24-hour cure period.

The columns are then painted with a layer of red iron oxide alkyd resin.

CONDITIONS OF USE

This report is limited to the applications and products as stated in this report. The ICC-ES Subcommittee on National Codes intends that the report be used by the code official to determine that the report subject complies with the code requirements and referenced standards specifically addressed in this report, provided the product is installed in accordance with the following conditions:

- The manufacturer shall provide the user of this report with complete instructions on the proper installation of Portland Columns. These instructions shall include, but not be limited to, methods of bracing the Portland Column and the members framing into it during construction, and any other precautions needed for the proper installation of Portland Columns. Where the installation instructions differ from this report, this report shall be null and void.
- The scope of this report is limited to the evaluation of Portland Columns to support compressive axial concentric loads which do not exceed the loads given in Table 1 of this report. Evaluation of the connections to the columns, or of other structural components in the building, including those components supporting the column, is beyond the scope of this report.
- The compressive strength of the columns, as given in Table 1 of this report, are based on factored load design. The values given in Table 1 of this report shall be used to determine the columns ability to resist the design loads given in Chapter 16 of the *BOCA National Building Code/1999*, when multiplied by the factors given in Section A4.1 of the *AISC Load and Resistance Factor Design Specification for Structural Steel Buildings*, 1998 edition.
- Use of the 3 1/2 inch Portland Column shall be limited to the basement of buildings of Type 5 construction.
- Installations of Portland Columns which will be directly exposed to the weather shall receive an additional coat of paint, enamel or other approved protective coatings unless encased in concrete made of non-corrosive aggregates.
- Special Inspections of the column installation and manufacturing processes shall be provided for columns used in other than Use Group R-3 buildings. The inspections shall be conducted by a special inspector who is provided by the owner of the building under construction. The special inspector must be qualified to

perform the inspections, and approved by the code official. The inspections must be of a nature, and conducted at such frequency, as is necessary to ensure the Portland Stone Ware's conformance to the requirements of their Quality Control Manual for the fabrication of the Portland Column. Inspection of the welding of the steel plates to the steel columns shall be provided by an AWS certified inspector.

- Portland Columns shall be installed vertically, either end up, with the bottom supported by an approved footing capable of safely supporting the imposed loads.

ITEMS REQUIRING VERIFICATION

The following items are related to the use of the report subject, but are not within the scope of this evaluation. However, these items are related to the determination of code compliance:

- ✓ Design calculations and details for the building system verifying compliance with this report.
- ✓ Connections of the columns to the footing and the supported construction.
- ✓ Special inspections and special inspector qualifications when required.
- ✓ Method of supporting the columns.

INFORMATION SUBMITTED

- Structural calculations signed and stamped by Mr. Walter McKinnon, P.E. The design values given in Table 1 of this report were determined using the AISC *Load and Resistance Factor Design Specification for Structural Steel Buildings*, 1998 edition for compressive strength design of composite columns.
- A written copy of the procedure used by Portland Stone Ware for the inspection of raw goods and the manufacture of concrete filled steel pipe columns was submitted. The procedure describes each item to be inspected, and names the person responsible for that inspection.
- Reports for the testing of 3 1/2 and 4-inch columns were submitted. Three specimens each of both columns sizes, 6 foot long were tested for maximum compressive load. The average maximum load carried by the

columns was greater than the loads indicated in Table 1 of this report for 6 foot columns by a factor of 1.86 for the 3 1/2-inch column, and 2.00 for the 4-inch column.

APPLICATION FOR PERMIT

- To aid in the determination of compliance with this research report, the following represents the minimum level of information to accompany the application for permit:
 - The language "See ICC-ES Legacy Report No. 93-36" or a copy of this report.
 - Product manufacturer's name.
 - Size and thickness of the steel pipe column.
 - Design calculations and details for the building system shall be furnished to the code official verifying compliance with this report. The individual preparing such documents shall be competent and qualified in the application of the structural design principles involved, and shall possess the registration or license in accordance with the professional registration laws of the state in which the project is constructed. The calculations and details shall include, at a minimum, the following:
 - The design loads imposed upon the column by the components it supports.
 - The ability of the Portland Column to sustain the design loads.
 - The ability of all connections between the column and the components framing into it, including the steel top and bottom plates, to transfer all the imposed design loads from the components supported by the column to the column, and from the column to its supporting footing.
 - The design of the footing which will support the Portland Column.

PRODUCT IDENTIFICATION

All Portland Columns manufactured in accordance with this research report shall be marked at the plant with the identifying language, "See ICC-ES Legacy Report No. 93-36," the manufacturer's name, model name, and the size and thickness of the steel pipe column.

Table 1
3 1/2-INCH and 4-INCH PORTLAND COLUMN DESIGN COMPRESSIVE STRENGTH¹

Column Length (in feet)	Design Compressive 3 1/2-inch column ²	Strength (in kips) 4-inch column
6.0	25.1	33.3
6.5	23.6	31.8
7.0	22.2	30.3
7.5	20.7	28.8
8.0	19.3	27.2
8.5	17.8	25.7
9.0	16.4	24.1
9.5	15.1	22.6
10.0	13.8	21.0
11.0	11.3	18.1
12.0	9.1	15.3
13.0	N.D.	12.8
14.0	N.D.	10.6

Notes to Table 1:

1. The compressive strength of the columns given above are based on factored load design. These values shall be used to determine the columns ability to resist the design loads given in the BOCA *National Building Code/1999*, when multiplied by the factors given in the AISC *Load and Resistance Factor Design Specifications for Structural Steel Buildings*, 1998 edition.
2. N.D. = Not Determined.

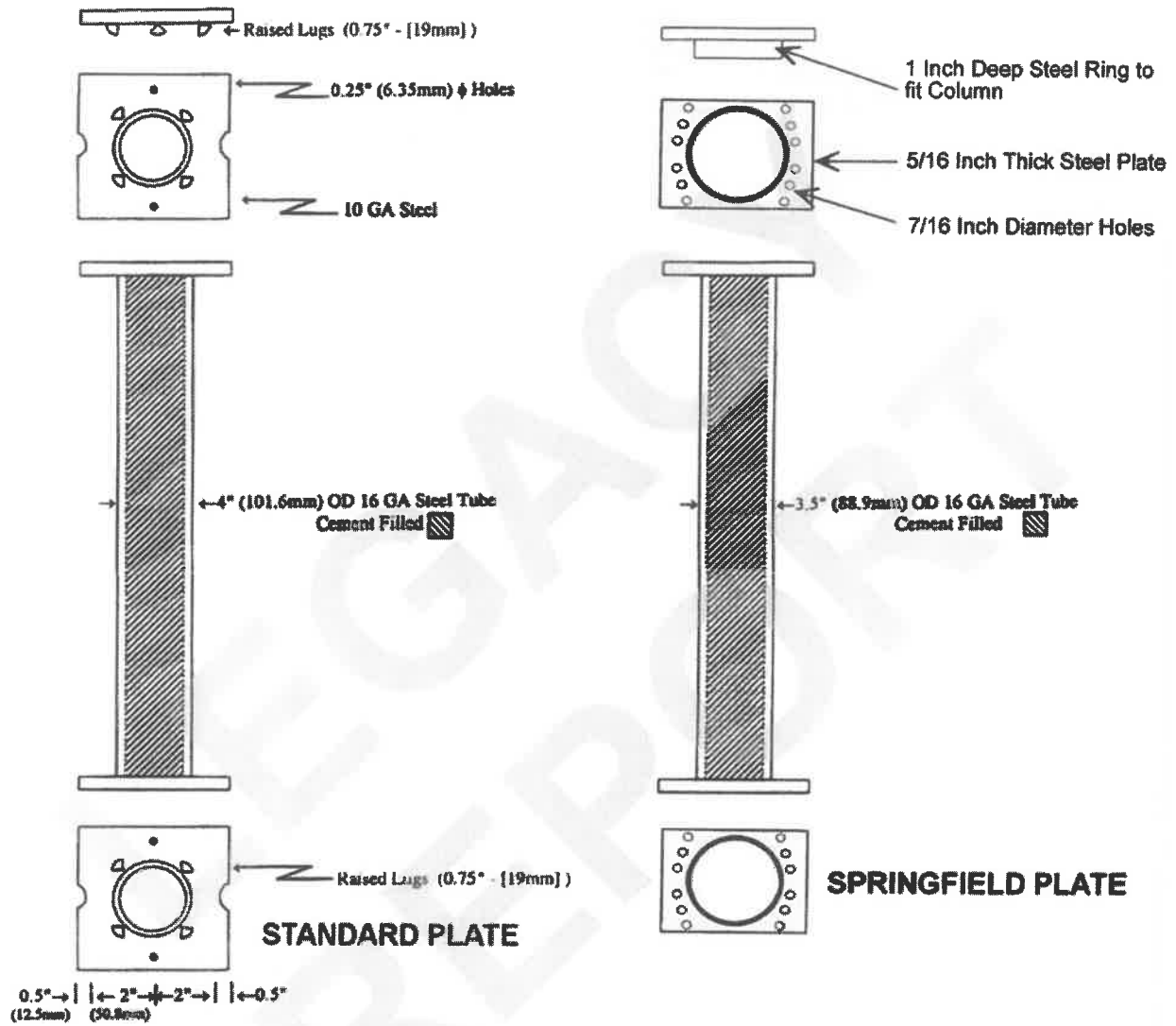


FIGURE 1*—PORTLAND 4-INCH COLUMN

FIGURE 2*—PORTLAND 3 1/2-INCH COLUMN

*THESE DRAWINGS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY ARE NOT INTENDED FOR USE AS CONSTRUCTION DOCUMENTS FOR THE PURPOSE OF DESIGN, FABRICATION OR ERECTION.