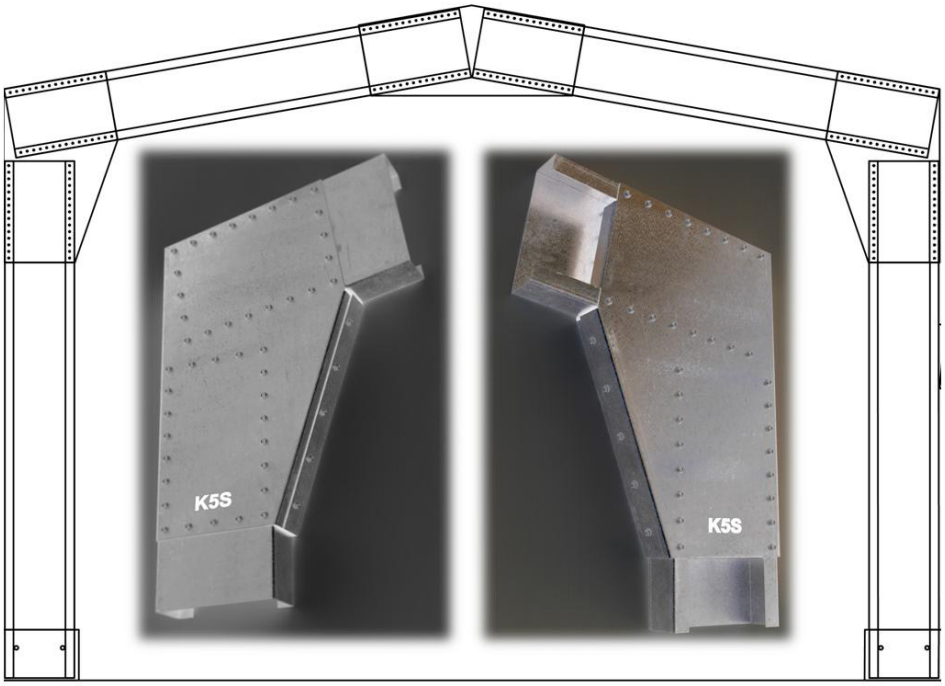
BRANZ Appraised
Appraisal No. 785 [2019]

K5S® STEEL PORTAL FRAME CONNECTORS - NEW ZEALAND



Appraisal No. 785 (2019)

This Appraisal replaces BRANZ Appraisal No. 785 (2012)

Amended 13 November 2020

BRANZ Appraisals

Technical Assessments of products for building and construction.

Product

1.1 K5S® steel brackets are prefabricated steel connectors for the knee, apex and other joints of cold-rolled steel C-section portal frames with tested capacities to AS/NZS 1170.0 and AS/NZS 4600.

Scope

2.1 K5S® steel brackets have been appraised for use as the connectors of cold-rolled steel portal frames within the following scope:

- Buildings subject to specific engineering design using the philosophy and design information contained within the Technical Literature, with roof pitches of 5° to 20°.
- Buildings subject to specific engineering design using the simplified design tables contained within the Technical Literature, limited to:
  - non-residential, single storey buildings; and,
  - pitched portal frames or monopitched portal frames; and,
  - roof slope of 10°; and,
  - maximum knee height of 9 m; and,
  - situated in NZS 3604 Wind Zones up to, and including, Very High; and,
  - no snow loads.

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, K5S® Steel Portal Frame Connectors, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:**

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. K5S® steel brackets meet the requirements for loads arising from self-weight, imposed gravity loads, earthquake and wind [i.e. B1.3.3 (a), (b), (f) and (h)]. Refer to Paragraphs 8.1-8.6.

Clause B2 DURABILITY: Performance B2.3.1 (a) not less than 50 years. K5S® steel brackets meet this requirement. Refer to Paragraph 9.1.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. K5S® steel brackets meet this requirement.

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Technical Specification

4.1 Components used with the system that are supplied by Shed Hub Ltd are:

- **K5S® steel brackets** are prefabricated in two pieces and are folded up from 2.45 mm thick G450 or 3.0 mm thick G250, Z275 coil coated steel sheet; or 4.0 mm thick G250 black steel which is hot-dipped galvanised after prefabrication. They come in a range of sizes suitable for joining 150 mm, 200 mm, 250 mm, 300 mm, 350 mm and 400 mm deep proprietary cold-rolled steel sections.
- **The K5S® steel brackets** have pre-drilled 6.5 mm diameter holes for the fasteners connecting the brackets to the portal frames. Where the brackets overlap, the top sheet has a 9 mm hole pre-drilled at fastener locations with no hole through the inner sheet.
- **Fasteners** - K5S® steel brackets are joined to the steel members through the use of self-drilling, self-tapping 14 g (10 tpi) x 30 mm screws supplied by Atlas, Konnect or Bremick. The screws have a minimum design shear capacity of 7 kN to AS/NZS 4600, and comply with Class 4 of AS 3566.2.

4.2 Accessories used with the K5S® steel bracket system that are supplied by others are:

- **Structural steel members**
  - Cold-rolled steel C-sections with depths of 150 mm to 400 mm. The sections are to be manufactured from Z275 galvanised steel coil.
  - Cold-rolled steel tophat sections of various depths for use as purlins and girts. The sections are to be manufactured from Z275 galvanised steel coil.
- **Fly braces** - 25 x 0.8 mm G550 steel strap.

Handling and Storage

5.1 K5S® steel brackets and other components should be stored in a clean, dry area until they are used. Should the metal components get wet they should be separated and dried to prevent premature corrosion.

Technical Literature

6.1 Refer to the Appraisal listing on the BRANZ website for details of the current Technical Literature for the K5S® steel brackets. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained within the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 Steel frames for buildings incorporating K5S® steel brackets are designed using information contained in the Technical Literature. This information allows for the specific engineering design of the structure, or alternatively, the Technical Literature also contains design tables that allow for a simplified design process.

7.2 The design tables for the K5S® steel brackets have been developed in accordance with the requirements of AS/NZS 1170 and AS/NZS 4600. A suitably qualified engineer must be used to design all structural elements outside of the scope of the K5S® steel brackets Technical Literature, in particular, foundations and bracing in the plane of the roof and walls.

7.3 The designs rely on the use of proprietary cold-rolled steel C-sections for use as portal frame members, and tophat sections for purlins and girts. Information on these products is provided in the Technical Literature, but they have not been assessed by BRANZ and are outside the scope of this Appraisal.

Structure

Specific Design

8.1 The Technical Literature contains the necessary information regarding the K5S® steel brackets to allow for specific engineering design of structural steel frames for buildings.

Simplified Design Process

8.2 The Technical Literature contains simplified span tables that allow the designer to specify the members and K5S® steel brackets to be used for construction. The tables are such that all of the members within a portal frame are the same size.

8.3 Tables are also included for specifying purlins and girts.

8.4 Information is given on footing reactions that will allow suitably qualified engineers to design footings for the portal frames based on the local ground conditions.

8.5 Snow loadings have not been taken into account for the portal frames in the design tables given in the Technical Literature. If snow loadings are to be allowed for, then specific engineering design needs to be undertaken.

8.6 Wind loads up to NZS 3604 Wind Zone Very High have been allowed for in the design tables. For higher wind loads than this, specific engineering design must be undertaken.

Durability

Serviceable Life

9.1 The K5S® steel brackets have a galvanised coating and are expected to have a serviceable life of at least 50 years if used in a closed building. For structures in areas of high corrosive risk or containing products that pose a high corrosive risk, an assessment of the required corrosion protection should be made in accordance with AS/NZS 2312 to ensure the required serviceable life is able to be achieved.

Maintenance

10.1 Portal frames constructed using K5S® steel brackets should be kept dry during service. The building envelope should be maintained to prevent the components getting wet. Any damage to the envelope must be repaired immediately.

10.2 System components that are damaged must be replaced as soon as possible.

Installation Information

Installation Skill Level Requirement

11.1 Portal frames incorporating K5S® steel brackets can be simply assembled.

11.2 The portal frames will be heavy and may require mechanical assistance to move and place. Lifting equipment including cranes, strops, spreader bars, etc., are specialist equipment and require suitable training to use. When moving or positioning portal frames there is a need to watch out for overhead power lines or other obstructions.

System Installation

12.1 The K5S® steel brackets are attached to the C-sections that form the rest of the portal frames with the use of the appropriate screws as defined in the Technical Specification. These are installed with the use of a drill with a suitable bit.

12.2 Each K5S® steel bracket knee, apex or other joints come in two pieces that are fixed one either side of the joint of the steel portal frame. Assembling the portal frames up off the ground on supports will allow access to both sides of the joints.

12.3 Cutting of the steel C-sections should be in accordance with the manufacturer's instructions.

12.4 K5S® steel brackets must not be altered. Any cutting or grinding of the K5S® steel brackets may affect their performance and load carrying capability, and Shed Hub Ltd should be contacted before any alterations are made.

Health and Safety

13.1 K5S® steel brackets are manufactured from steel. They may be heavy and may have sharp edges. Care should therefore be taken when handling them. It is recommended that proper lifting techniques are used and that suitable gloves be worn to protect hands.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

14.1 BRANZ has carried out strength testing of the K5S® steel brackets joints and fixings.

Other Investigations

15.1 An assessment of the Technical Literature has been undertaken by BRANZ technical experts and an opinion given to its suitability.

Quality

16.1 Shed Hub Ltd is responsible for the quality of supply of the K5S® steel brackets.

16.2 Engineers are responsible for the design of the structure incorporating the K5S® steel brackets in accordance with the Technical Literature.

16.3 Quality on-site for the assembly and erection of portal frames incorporating K5S® steel brackets is the responsibility of the building contractor.

16.4 Building owners are responsible for the maintenance of the building to ensure that the K5S® steel brackets remain dry in service.

Sources of Information

- AS 1397-2011 Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium.
- AS 3566.1-2002 Self-drilling screws for the building and construction industries – General requirements and mechanical properties.
- AS 3566.2 Self-drilling screws for the building and construction industries Part 2: Corrosion resistance requirements.
- AS/NZS 1170 Structural design actions.
- AS/NZS 2312: 2014 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings.
- AS/NZS 4600: 2018 Cold-formed steel structures.
- NZS 3604: 2011 Timber-framed buildings.
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No 1, dated 13 November 2020

This Appraisal has been amended to change the Appraisal Holder and to include a new fastener.

BRANZ

In the opinion of BRANZ, K5S® Steel Portal Frame Connectors - New Zealand are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Shed Hub Ltd, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Shed Hub Ltd:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions;
   d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Shed Hub Ltd.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Shed Hub Ltd or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
7 June 2019