Introduction

This manual presents load tables for a number of practical design situations. Tables should be read in conjunction with the systems information as given earlier.

Steadmans have used a flexible approach to the number of rows of sag members, to allow maximum freedom of choice for the designer and Architect. Information on this topic should be obtained from the relevant section of the manual prior to selection of purlins and rails.

Note that if zero rows of sag bars are used then temporary bracing may be required during erection to avoid distortion of purlins and rails.

Load tables are based on calculations to BS 5950-5:1998 using a combination of rational analysis and component testing on sleeve connections. The tables are based on the use of restraining metal cladding. For the cases of non-restraining cladding and hook-bolt fixed cladding the design disk should be used in conjunction with the sag systems.

Purlin Load Tables

Load tables provide unfactored gravity load capacities which are based on the lesser of the purlin working load capacity or as controlled by a deflection limit of Span/180. The tables also provide ultimate load capacities for gravity load, wind uplift and for deflection limits of Span/180 and Span/150. Wind uplift capacity values are given for three conditions, i.e. 0 rows, 1 row and 2 rows of purlin braces, within the limits of the information provided. (Refer to page 4 in the Zed Purlin Systems PDF)

When evaluating factored and unfactored loadings the self weight of the purlin section need not be considered as this effect is included in the load tables, with the exception that the deflection-controlled values are based on deflections only, excluding self weight effects, so that other limits may be adopted by pro-rata.

Purlins are frequently selected on the basis of a gravity load deflection limit of Span/180 but there may be a number of cases, including agricultural buildings, where other limits may apply. In the case of agricultural buildings the designer may choose to select purlins on the basis of the load given for the Span/150 limit, for unfactored loads, and on the basis of the ultimate capacity for factored loadings. Some claddings may require more stringent deflection limits and these may be determined by pro-rata. It is not usual to limit deflections for wind uplift cases but if required the designer can evaluate the unfactored net wind uplift and limit to the deflection-limit capacity given in the tables. Note that purlin design may be more readily carried out using the Steadmans design software.

Wind loadings should be evaluated to the relevant code of practice and should be increased by a suitable load factor (usually 1.4), with the cladding dead load deducted to give the factored net loading.

The load tables apply to roof slopes up to 25 degrees, for steeper slopes the design software should be used or consult Steadmans direct.

Sheeting Rail Load Tables

Sheeting rail tables are based on the usual assumption that cladding dead weight does not cause significant bending in the vertical plane. This condition is satisfied in practice if the cladding weight is supported by the eaves beam or at the base of the panel or if the cladding is fixed in such a manner as to form an effective diaphragm. (Refer to BS 5950-5:1998.) Should the designer consider that the wall cladding weight should be carried by the rails (prudent for heavy claddings) then the design program can be used with this option selected.

Tables have been evaluated with deflections limited to Span/100 and Span/150. The user may pro-rata the deflection controlled values if a more stringent limit is required. Tables allow the use of O rows, 1 row, 2 rows or 3 rows of sag members in particular circumstances and the user should refer to Zed & Cee Sheeting Rails PDF page 4 for guidance.

A specific table of values is given for brickwork restraints, with values provided for single, two-span and three-span conditions to allow the designer a wide variety of solutions. Loads are provided based on capacity and for the commonly used deflection limit of span/300. They are based on the assumption that the brick ties provide full restraint to the rails and if this is not the case advice should be sought from Steadmans. Use the lesser value of capacity and deflection limit in design. If an alternative deflection limit is required this can be selected by pro-rata. Alternatively the design program may be used with a suitable deflection limit selected.

Eaves beam load tables

Tables are provided for eaves beams for single and double span cases within the limits of the product. The tables are based on the assumption of restraining type roof cladding. It is assumed that horizontal wind forces are carried by the eaves beam and braces and hence into the roof diaphragm. The designer should be satisfied that suitable load paths exist for these forces. For cases where the wall cladding is fixed near the top flange of the eaves beam then the designer may wish to consider that the horizontal wind is carried by the fixings directly into the roof diaphragm, provided restraining type roof cladding is used.

Non uniform spans

The most economical design of frames and cold-rolled sections occurs when all spans are of equal length. However there are circumstances where it is not possible to achieve this due to practical constraints. This section gives an indication of how to deal with non-uniform design cases, based on guidance in BS 5950-5:1998.

Case 1

Spans not varying by more than 20% of the maximum span.

a) Sleeved or Heavy End-Bay System

In this case select sections and sleeves on the basis that all spans are assumed to equal the maximum span.

b) Butted system

Select a section for each span individually, or for the maximum span. Note that it is usual to maintain the same depth of section for all spans so that the same cleats are used throughout, though this is not mandatory provided detailing is suitably adapted.

Case 2

Spans not complying with case 1, but within specific limits.

a) Sleeved or Heavy End-Bay system

Split the run of sections into a number of sets of spans where the variation in each set is not more than 20% of the largest span in that set and choose section thickness on the basis of the largest span in each set, i.e. treat each set of spans as a case 1 situation.

b) Butted System

This may be used without limitation.

Case 3

Spans not complying with the limits of case 1 nor case 2.

In this case, either use butted sections throughout the structure or contact Steadmans for specific advice.

NOTE: Where span variations are unavoidable the most robust structure will result if the larger spans are kept away from the end bay locations.

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