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RESTRUCTURING STUDY OF THE AISC SPECIFICATION

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A Technical Report
of a Research Program
Sponsored by
The American Institute of Steel Construction

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GLOSSARY

algorithm - explicitly defined procedure

base - category of top level organization: stress state, limit state, or component

base, element of - a particular type of stress state, limit state, or component; e.g., axial force, yield, or member

base, subelement of - used to further define element of a base; e.g., tension could be a subelement of axial force, or thin-walled shape could be a subelement of member

boolean (or logical) variable - variable that may have the value "Yes" or "No"

branch - arrow pointing from one node to another

component - physical part of a structure; member, stiffener, etc.

conditional execution - execution procedure where highest (output) level criteria are processed first and lower level provisions are introduced when needed

criterion - functional relationship intended to provide an adequate margin of safety with respect to a particular mode of failure

decision table - an explicit logical procedure in tabular form that indicates action to be taken for particular combinations of known conditions

delayed decision - processing decision tables by halving technique so as to require fewest number of tests per table (on the average)

dependents of a data item - data whose values are affected by the value of the data item detailed level organization - organization of paragraphs or individual provisions of the text

direct execution - execution procedure where lower level provisions are processed before higher level provisions referring to them, so that all data are defined before their first use

format - written text of Specification

function - a formula used for evaluation of a datum that is not changed when related conditions change

functional network - network of data used to evaluate design criteria

immediate decision (quick rule) - processing decision tables by attempting to isolate common or frequently occurring rules first

ingredients of a data item - data used to evaluate the data item

intermediate level organization - organization of the provisions in functional network of a design criterion or criteria

limit state - mode of unsatisfactory behavior (yield, instability, etc.)

network - graphical representation of a data structure; system of nodes interconnected by branches

node - point in a network representing a data item

organization - overall outline for the Specification

stress state - type of stress (tension, shear, combined stress, etc.)

tagging - associating a section or provision with a triplet, or vice-versa

topical outline - overall top level outline for the Specification

top level organization - overall organization of the Specification

triplet - valid combination of the three bases (limit state, stress state, component) pertaining to a criterion or provision

CHAPTER 1

INTRODUCTION

1.1 Purpose of the Specification

The AISC Specification [4] is a document intended to serve three different purposes in relation to the general public, the structural design profession, and the steel industry. The public purpose is to assure that steel structures designed and fabricated according to the Specification are safe, functional, and economical. As a guide to designers, the Specification is intended to provide direct, efficient design procedures incorporating realistic analytical, experimental and empirical knowledge. For the steel industry, the Specification is expected to contribute to the use of fabricated steel by facilitating the designers' use of steel.

1.2 Resistance to Changes of the Specification

The Specification has been repeatedly revised prior to 1969 in order to introduce advances in technology and knowledge. With the 1969 Edition, it has become the policy of AISC to update the Specification on an annual basis. Such revisions and updates are obviously necessary for all three intended purposes of the Specification: for the public, to benefit from the improvements in economy and safety; for the design profession, to improve the design procedures and increase confidence in the designs produced; and for industry, to maintain and improve the competitive position of fabricated steel buildings.

It is widely recognized, however, that such advances are not accepted with unmitigated joy by all parties concerned. In particular, the burden falls most heavily on the designers, who are repeatedly being asked to forego familiar procedures for new ones, the background of which they may not thoroughly understand. Unless proper steps are taken, designers will resist the changes, or, if they are approved, will tend not to take advantage of them. As a consequence, the public does not realize the potential benefit from the changes and the industry loses some of its long-term competitive advantage through the designers' reluctance to consider steel as an alternative design.

There is a widespread belief among designers that every change in the Specification automatically increases its complexity, and therefore the cost of using it. This feeling may have some validity if subsequent changes are to follow the pattern of previous editions, including the 1969 one, where new provisions have been inserted without exploring all of their interactions with other provisions (new or old), or entire new sections were added using different philosophies or organization than the previous ones. As a consequence, whatever simplification or rationalization is provided by the new provision or section, it is significantly negated by the increased difficulty of relating it to other provisions.

1.3 Previous Study

The previous study on the decision table formulation of the Specification [1] has shown that its detailed provisions can be represented as individual decision tables. The study has also shown that the individual provisions of the Specification are free of overt omissions, inconsistencies and contradictions. On the other hand, the decision table formulation has made explicit the long-recognized inconsistency in the interrelationships among the various provisions by defining the underlying network of cross-references among the variables involved (e.g., the term "net area" used in 1.5.1.1 is computationally defined in 1.14, etc.).

In the previous study, the tables were labeled and arranged so as to preserve as much as possible the present textual organization of the Specification. This arrangement demonstrates quite vividly the lack of clarity and consistency of the textual organization itself. The prime reason for this, as discussed above, is that the text has been revised through the years to introduce advances in technology, with the result that provisions intended to be used in conjunction may be widely scattered in the text, without any explicit cross-referencing.

Finally, the previous study has shown that the Specification refers to over 400 distinct items of data, rather than the 120 or so items listed in the Nomenclature. However, there is no correlation between the organization of the Specification and the natural organization of these data as they arise in the course of design.

1.4 Objective of Study

The objective of this study is to explore and develop concepts and methods for more rational organizations for the Specification, both for written and computer-implementable forms. It is recognized that different organizations may be required for these two forms: the major goal for the written specification is clarity which gives the user confidence that his design objectives are achieved with safety, functionality, and economy; whereas the major goal for computer implementation of the logic of the Specification is total efficiency, which includes adaptability to interfacing with project data files and analysis and design routines as well as computation time. This report deals primarily with the textual organization of the Specification. The implications of this study on computer implementations are briefly discussed in Chapter 5.

As will become apparent from the discussion that follows, it is not feasible to develop the final, definitive organization for future editions of the Specification in this study. The selection of such an organization involves a host of philosophical considerations that require the input and careful consideration of the entire Specification Advisory Committee. This study can only provide guidelines to that Committee, as well as a set of tools that facilitate simulation of alternative organizations for evaluation of their suitability.

It is hoped that the combination of guidelines and tools arising from this study will enable the Specification Advisory Committee to arrive at an organization of future editions of the Specification which will allow easy incorporation of new technology, and, at the same time, remove many of the valid objections to the present organizational growth of the Specification.

1.5 Organization of Report

In Chapter 2, procedures are defined for representing the logical structure of the current Specification as a network of data. Levels of organization of the logical structure are presented in Chapter 3. Computer aids and algorithms for textual organization are given in Chapter 4 along with detailed examples. Conclusions reached in this study, and recommendations for further work are presented in Chapter 5.

A glossary of terms that may be unfamiliar to the reader is the beginning of this report. The brief definitions given are intended only to refresh the memory of the reader when necessary. In most cases, detailed explanations are given in the text where the terms first appear. At times it may be necessary to refer to the references cited.

CHAPTER 2

AN ABSTRACT VIEW OF THE SPECIFICATION

In this chapter, an abstract model of specifications in general, and the AISC Specification in particular, is developed. The objective is to isolate the basic components of the specifications, and thereby set the stage for discussing potential aids for organizing the Specification.

2.1 Criteria

A design specification consists fundamentally of a collection of design criteria to be satisfied. A criterion may be defined as "a functional relationship intended to provide an adequate margin of safety with respect to a particular mode of failure" [3]. In the above definition, "mode of failure" is to be interpreted in the broadest terms, to include serviceability conditions as well as utlimate behavior conditions.

A criterion is usually stated in the text using terms such as "shall not exceed," "will be limited," and the like. It is thus natural to assign to each criterion a status, which has two possible values: "satisfied" or "violated." Occasionally, criteria appear in the Specification which are not given in the above form, but rather as a side-condition to more basic criteria.

The design criteria specifically included in the present Specification are listed in Table 2.1, together with the decision tables in Ref. 1 which specify the manner in which they are to be evaluated (the numerical portion of a decision table designation corresponds to the section number in the text).

It is obvious from an examination of Table 2.1 that not all criteria pertain to the same level of decision-making in the design process. Typically, the criteria appearing in the present text are collections of more specific criteria pertaining to particular modes of failure. For example, the "Compression Member Check" of Section 1.5.1.3 may be represented in decision table form as follows:

Section 1.9 satisified	Y	E
$K\ell/r \leq 200$	Y	
$f_a/F_a \leq 1.0$	Y	
Criterion satisfied	Y	
Criterion violated		Y

Thus, a compression member has to satisfy simultaneously the three subsidiary criteria shown in the decision table. Conversely, the two criteria shown in Table 2.1 as pertaining to Section 1.6.1 are a single unit. Finally, the "criterion" for a heterogenous connection pertaining to Section 1.15 is not a criterion at all according to the definition given above, but simply a procedural or analysis prescription instructing the designer how to allocate loads to connectors.

In summary, criteria represent the basic, governing conditions which a design must satisfy in order to be acceptable. The present list of criteria, however, is both incomplete and uneven in its organization. We return to this topic in Section 3.1, where a consistent method of identifying and organizing criteria is suggested.

2.2 Functional Network

The AISC Specification specifies a hierarchical sequence of computations, checks, formulas, limits, etc., leading to the evaluation of each criterion. The hierarchy of these functional or operational provisions, as well as their interconnections, may be represented independent of their textual representation by a graph or logical network. This graph identifies the data referred to in the Specification and the relationships of each datum to other data. The succeeding sections deal with the development of the salient features of this network.

2.2.1 Data Items

An individual item of data, or datum, may be one of the following:

a) the status of a design criterion, which, as discussed in Section 2.1, has possible values of "satisfied" or "violated;"

b) a property which has numerical value, such as allowable bending stress F_b;

c) a quantity which has as its value one of several alphabetic names, such as "section shape" which may have values of "channel," "wide flange," etc.; or

d) a logical variable which has possible values "true" or "false," such as the variable "sideway prevented."

There are two sets of relationships between the data items. The functional relationship deals with the source of data, i.e., the manner in which a value is assigned to the data item in question. A data source may be:

a) given by the design data, tables, or other source (e.g., the area of a standard section or the designer's knowledge whether sideway is prevented);

b) generated by an explicit algorithm, an algebraic function, or subroutine (e.g., $C_c = \sqrt{2\pi^2 E/F_y}$); or

c) derived from a logical procedure such as a decision table. For example a decision table to compute F_a is shown below:

$K\ell/r \leq C_c$	Y	N
$F_a = \dfrac{Q_s Q_a \left[1 - \dfrac{(K\ell/r)^2}{2C_c^2}\right] F_y}{\dfrac{5}{3} + \dfrac{3(K\ell/r)}{8C_c} - \dfrac{(K\ell/r)^3}{8C_c^3}}$	Y	
$F_a = \dfrac{12\pi^2 E}{23(K\ell/r)^2}$		Y

These three classes of data sources appear adequate for the AISC Specification. A fourth class, that of data assigned by a subjective expert opinion, may be included in a more general logical network of design.

From the standpoint of the logic of the Specification a more important relation between items of data is their precedence in evaluation, regardless of the algorithms or procedures of evaluation themselves. These logical relations between items of data may be concisely expressed by two related lists, the ingredience and dependence lists for each datum.

In the example b) above, the data items E and F_y are ingredients of the datum C_c. Conversely, C_c is a dependent of both E and F_y, as C_c cannot be evaluated without knowing E and F_y, and if either changes in value, C_c must also change. When a datum is derived by means of a decision table, its ingredients include both the data items defining the applicable conditions and the data items involved in the actual calculations. By the same reasoning as used above, the derived data item is a dependent of both sets of data items, as its value is affected by the applicable conditions just as much as by the computational ingredients.

The data items used to evaluate the data item generated by a decision table can be classified as dynamic ingredients or common ingredients. Dynamic ingredients are data used only when certain rules are matched. Common ingredients are the data used regardless of which rule is matched. For example, in the table used to generate F_a, the common ingredients are K, ℓ, r, and C_c, because they are used for either of the two rules. The dynamic ingredients are Q_s, Q_a, and F_y when the first rule is matched and E when the second rule is matched.

2.2.2 Properties

Using the above definitions, the abstract logical network can be readily created by:

a) assigning a node (point) to each data item, regardless of source; and

b) drawing an oriented branch (arrow) from each datum to each of its dependents.

For example, the network corresponding to the criterion "Compression Member Check," Section 1.5.1.3, discussed earlier is shown in Fig. 2.1. (See Appendix C for definition of data.) Nodes with a single circle are input data and nodes with a double circle are evaluated by a function or decision table.

The global network for the entire Specification can be automatically generated from the local ingredience list of all data items. Such a global logical network permits one to trace out two sets of relations or influences:

a) the global dependence of a datum, consisting of all data items depending on it, is obtained by traversing the network from the given datum in the direction of the arrows until all data items which may be reached in this fashion are enumerated; and

b) the global ingredience of a datum, consisting of all data items influencing it, is obtained by traversing the network from the datum in the direction opposite to that of the arrows until all data items which may be reached are enumerated.

It is obvious that input items are identified in the global network as those which have no ingredients (all arrows point out); similarly, terminal or output items are those which have no dependents (all arrows point in). More generally, each datum in the network can be assigned two numbers:

a) the global level from input, i.e., the number of branches on the longest chain from any input item to the datum in question (as an example, the levels from input of the present criteria in the Specification are shown in the last column of Table 2.1); and

b) the global level from output, i.e., the number of branches on the longest chain from the datum in question to any terminal or output item.

These definitions use the longest path because a given datum may have several ingredients and dependents and the path lengths for each may be different.

In summary, the functional network defined by the data items and their lists of ingredience and dependence is independent of the organization of the Specification. The functional network displays all transformations from the input data to the output, the latter being defined as the criteria discussed in Section 2.1.

2.2.3 Revision of Decision Tables

It is worthwhile to repeat that the functional network introduced in this study is based on the premise that each decision table produces a single data item as its output. ~~By~~ In contrast, in the original decision tables presented in Ref. 1 many of the tables were shown to produce several different, but related, data items. For the purpose of this study, it was necessary to reformulate all of the tables of Ref. 1 which produced multiple output. These revised tables are being published elsewhere.

An example of reformulating the decision tables is given in Table 2.2. Decision Table 1.5.1.3.a of Ref. 1 is shown in its original form having four different actions. This table can be decomposed into two smaller tables and two functions as shown on the second page of Table 2.2. Functions 1.5.1.3.a.1 and 1.5.1.3.a.4, are each computed with a single formula, as they do not involve any conditional entries. The two tables resulting from the reformulation are much smaller and simpler than the original table. Only the condition "$K\ell/r \leq C_c$" is needed for choosing the formula to compute F_a, and only two conditions, "Bracing/ Secondary Member" and "$\ell/r > 120$," are needed for selecting the formula to compute F_a'.

The conditions "Main Member" and "Bracing/Secondary Member" make up a mutually exclusive set, i.e., one condition in the set is "Yes" and the others are "No." Mutually exclusive sets have been treated as vectors of boolean data in this study, where each vector is represented as a single data item in the overall data structure of the Specification. The rationale for using this scheme is that each mutually exclusive set defines one particular data item, as discussed in Section 2.2.1.c, and should be represented by a single node in the data network. For example, the set "Main Member, Bracing, Secondary Member" denotes the type of component. The lists of vectors used in the reformulated decision tables is given in Appendix C.

2.3 Organizational Network

A designer, or any other user of a given set of specifications, must accomplish two things:

a) determine which criterion or criteria are applicable to the situation at hand; and

b) for each of the applicable criteria, determine the steps necessary to evaluate the criterion.

The functional network defined in the previous section is, by itself, insufficient guidance to the user for the above two purposes, as it contains only a list of design criteria, without any relation between them. The organization of the Specification must therefore provide a grouping and ordering to the individual criteria so as to provide a logical and consistent entry to the various criteria which must be evaluated.

From an abstract standpoint, the grouping and ordering of the criteria may be represented as a second, or organizational, network which originates from a single entry node and proceeds through a series of branching points, corresponding to the various major categories of organization, to the appropriate criteria which must be evaluated.

For illustrative purposes, the network corresponding to the present Specification is shown in Fig. 2.2. The figure covers only those portions of the Specification which are quantitative in nature, i.e., lead to specific design criteria. In accordance with the definitions of the previous two sections, each section or subsection of the Specification is represented by a node of the graph and has two types of ingredients: a higher-level section, and one or more input data items. The latter ingredients are described qualitatively; a more precise description of these will be given in Section 3.1.

If the two networks are now combined, it can be seen that the criteria involved in the Specification have two types of ingredients:

a) "functional" ingredients which relate the criteria to the intermediate and input data from which they are evaluated, as represented by the organization-independent functional network; and

b) "organizational" ingredients which relate the criteria to the overall organization of the Specification.

2.4 Summary

It is the thesis of this study that the logical structure of the Specification can be represented in an abstract way by means of the two interrelated networks discussed in the previous sections. Furthermore, these two networks provide an optimal basis for investigating alternate formats for presenting the scope and intent of the Specification in textual form.

It will be shown in the succeeding chapters that for the functional network, alternate formats of the text represent simply alternate methods of displaying the two-dimensional functional logic network in one-dimensional or sequential textual form. It is, of course, assumed that alternate formats of the functional network do not alter any meanings or relations.

It will also be shown that for the organizational network, alternate organizations of the text represent alternate ways of grouping and ordering criteria and their corresponding organizational network. In this case, it is assumed that alternate organizational networks do not introduce additional criteria.

CHAPTER 3

LEVELS OF TEXTUAL PRESENTATION

In the previous chapter, it was postulated that the Specification has a unique logical structure, but that this structure may be presented to a reader in a variety of forms. No rules for organization of a text are known to the writers. Rather than defining one organization and defending it against alternatives, our objective is to identify the hierarchy of information in the Specification, note approaches to its textual elaboration, and develop procedures to aid the Specification Advisory Committee in deciding upon textual format. This chapter presents a decomposition of the textual format, and discusses the alternatives available at each level. Chapter 4 describes the tools developed in this study for investigating alternatives at two of these levels.

The format of the text of the Specification must be viewed at three levels. The top level consists of bases for classification of subject matter, and corresponds to the organization as discussed in Section 2.3. The intermediate level deals with the textual expression of the functional network corresponding to a given criterion. The detailed level concerns the specific provisions for derivation of a datum, and may correspond to a single paragraph of the text or a single decision table.

3.1 Top Level

The top level of the Specification provides the overall organization of the text, by directing the user to the applicable criterion or criteria and by grouping related criteria into larger units.

3.1.1 Possible Bases of Organization

There are several possible independent bases for organizing or grouping criteria. Furthermore, the independent bases can be hierarchically structured in any consistent order.

The possible bases are:

1) Philosophy of Design, which may include working stress design, plastic design, or load factor design. Different, but not completely distinct functional networks are associated with each philosophy.

2) Limit States, which are modes of unsatisfactory behavior. Each is independent of the philosophy of design because the structural behavior depends on actual topology, geometry, proportions, and loadings rather than the philosophy used to prescribe them.

3) Physical Components, which include beams, columns, connections, fasteners, etc. These are identifiable independently of philosophy of design or limit state.

4) Implementation Procedures, which include processes such as design, preparation of plans, fabrication, etc. These stages in building are essentially independent of the above bases.

5) Stress States, which include the familiar types of tension, compression, etc.

The basis "Implementation Procedure" can be ignored for the remainder of this study, inasmuch as we are dealing only with the procedure labeled "design" (including detailing) and the remaining procedures of "fabrication" and "erection" are outside the scope of the study.

On the other hand, the basis "stress state" must be taken into consideration, first, because it is an intimate part of the present organization, and thus familiar to everyone, and second, because it defines the structure of a large number of limit state criteria.

Thus, there are four bases available, and therefore 4! = 24 possible hierarchical orderings, which differ according to which basis is associated with the topmost level (parts), second level (sections), etc. However, there is a major distinction between these four bases. Two of them, limit states and components, are complete or exhaustive, in the sense that all conceivable provisions of the Specification can be uniquely classified according to both of these bases. By contrast, the other two bases are incomplete in the above sense: the "philosophy of design" basis because load factor design actually encompasses both working stress design and plastic design, the "stress state" basis because some provisions cannot be conveniently expressed in terms of stress states (e.g., essentially all provisions pertaining to serviceability criteria).

For the reasons stated above, strictly from a logical standpoint, orderings associating philosophy of design and/or stress state bases with the upper levels of the hierarchical orderings should be avoided. Unfortunately, these are precisely the two bases which occupy the two highest levels in the organization of the present Specification. Thus, there may be considerable resistance against adopting a more logical, but drastically different, organization.

3.1.2 Shortcomings of Present Organization

It appears highly desirable that the textual organization be related to the above bases in some systematic hierarchical combination. The present organization of the Specification clearly does not satisfy this requirement. As an illustration, the relations of the major sections of the 1969 AISC Specification to these bases are shown in Table 3.1. A relationship denoted by an X implies specific use of the basis in the section. The growth of the specification by accretion is evident. Part 2, covering plastic design, consists only of exceptions to Part 1 which contains the general procedural section as well as provisions appropriate only to working stress design.

As a further illustration of the present organization, an alternate organizational network to that of Fig. 2.2 is shown in Fig. 3.1. This network corresponds roughly to the interpretation of the present edition incorporated in Ref. 1. Note that the network has the same terminal nodes as Fig. 2.2, i.e., involves the same criteria, but their order is considerably different. Each of the input data items (defined in Appendix C) controlling the organizational nodes is labeled as to the base used. It is clear that there is no systematic, hierarchically organized relationship between the nodes of the network and the bases of organization.

3.1.3 Decomposition of Criteria

The reason why the present organization of the Specification is inconsistent and not amenable to alternate textual formats at the top level lies with the definition of the present criteria.

A reexamination of Table 2.1 will reveal that the criteria in the present Specification cannot be completely defined in terms of the elements of the bases discussed above. Returning to the example of the criterion cited in Section 2.2.2, the criterion "Compression Member Check" can be defined or "tagged" as pertaining to

{ Type of component = member
  Type of stress state = compression

but the criterion cannot be uniquely defined by limit state since both instability and yielding limit states are applicable. Furthermore, it cannot be stated that this criterion governs for most compression members since the effects of bending are not included in this criterion.

Thus, before alternate top-level textual formats can be generated, it will be necessary to decompose the present criteria, or identify new ones, which can be uniquely defined in terms of the bases described. An attempt at such a decomposition, and illustrations of the resulting alternative formats that may be generated is presented in Section 4.1.

3.2 Intermediate Levels

On the intermediate level, within each of the sections defined by the top level, the Specification typically deals with a single criterion or a set of closely related criteria and their underlying functional network. This network consists of interrelated provisions and formulas where the output from one provision becomes an ingredient for another, higher level provision. A typical network of this type has been presented in Fig. 2.1.

A textual arrangement of such cascades of provisions can take one of two alternative forms, corresponding to the concepts of direct or conditional execution as introduced in Ref. 1. A textual arrangement for direct execution means that a lower-level provision is listed before any higher-level provision referring to it so that all terms, conditions, etc., are defined before their first use. By contrast, the textual representation of conditional execution starts with the highest, output-level criteria and then proceeds to list the intermediate and lower level provisions in the logical order they would be encountered in any actual processing.

The procedures developed for generating textual formats according to the two alternative strategies are discussed in Section 4.2, and illustrated with examples.

3.3 Detailed Levels

The detailed level of textual format corresponds roughly to a single paragraph in the Specification text. This level is not specifically shown in the logic network, as information on this level is typically contained in a single decision table and represented as a single node in the network.

There are again two general approaches to the textual expression of the logic, corresponding to the immediate and delayed decision rules for converting decision tables into flow diagrams, as described, for instance, by Fenves [2]. The immediate decision rule leads most directly to the most common outcomes, while the delayed decision rule requires the fewest number of tests in arriving at an outcome.

It appears that human comprehension is aided by the immediate decision rule while automatic data processing can benefit from delayed decisions. These advantages can be realized without conflict. It appears that just one of the two approaches should be used in the text to avoid discordance. An example of a Specification paragraph organized according to the two strategies is given in Section 4.3.

CHAPTER 4

AIDS FOR ORGANIZING THE SPECIFICATION

Computer aids have been developed in this study to automatically generate topical outlines for the Specification and to perform intermediate level organization for either conditional or direct execution. These aids are presented in Sections 4.1 and 4.2. No computer aids are available for detailed level organization, but examples of processing decision tables by the delayed decision or immediate decision rule are presented in Section 4.3.

4.1 Top Level Organization

The overall organization of the Specification can be generated by hierarchically structuring the independent bases presented in Section 3.1.1. A program (OUTLINE) developed in this study will generate topical outlines of the Specification for any of the $3! = 6$ possible orderings of the three bases: limit states, stress states, and physical components. The basis "philosophy of design" has been omitted because it would probably not be a major basis of organization for the reasons discussed in Section 3.1.1, but could be easily added at the cost of much redundancy in the outline.

The input to the OUTLINE program consists of a list of all applicable combinations of elements of the three bases, referred to as "triplets." Elements of the bases are lists of the applicable types of components, limit states, and stress states. Subelements are used to define the different types of elements more explictly. For example, consider the following triplet:

type subtype.

Type of component = member, thin-walled shape

Type of stress state = axial force, compression

Type of limit state = instability, global

In this triplet, thin-walled shape is the subtype of member, and member is the type of component. A similar relation exists for the stress state and limit state bases. Note that the term global instability refers to member instability (Euler buckling in columns or lateral-torsional instability in beams), whereas, local instability (used in later examples) refers to buckling of flanges or webs at a localized point along a member. It should also be noted that thin-walled shape describes shapes such as wide-flanges, boxes, T-sections, channels, etc., and should not be confused with light-gage, cold-formed products. This triplet will appear in the topical outline hierarchically structured for a given ordering of the three bases. An identification label, such as a section heading, may be input with a triplet, and it will appear in the outline along with the triplet. The OUTLINE program has the capability of handling major elements of triplets with one level of subelements, which seems to be sufficient at the present time. However, if necessary, the program could be modified to include more than one level of subelements.

After a data file of all the valid combinations of elements and subelements of the three bases, i.e., the applicable triplets, has been prepared, one needs only to specify the order of the bases for generating an outline. The program then begins to generate every possible combination of bases, checking to see which combinations or triplets have been listed as valid by the user. The valid triplets are output in conventional outline form.

The elements and subelements in the outline (i.e., subtopics of the outline) are output in the same order as they appear in the input file. This order may be changed by making corresponding changes or order in the data file. The program could be modified to automatically reorder elements and subelements to produce a better organized topical outline.

Detailed examples of using the OUTLINE program to generate the top level topical outline for the Specification are presented in Sections 4.1.1 and 4.1.2.

4.1.1 Generation of a Topical Outline Based on the Criteria in the Present Specification

As discussed in Section 3.1.3, many of the design criteria in the present Specification, shown in Table 2.1, cannot be uniquely defined by a single triplet. To demonstrate this phenomenon, the triplets applying to each design criterion were listed and used as input to the OUTLINE program. A tabulation of the triplets is given in Table 4.1. The triplets consist of labels denoting specific elements and subelements of the three bases followed by a section number or identification label. The identification label will appear in the outline alongside the triplet and will serve to show where a particular criterion or provision is referenced in the outline. A dashed subelement entry for any base means that no description at the subelement level for that base is necessary, i.e., the element label for the base was sufficient for defining the triplet. For example, the first row of Table 4.1 corresponding to the first triplet is interpreted as follows:

Type of component = element of connection, pin

Type of limit state = yielding, (no subelement)

Type of stress state = bearing, (no subelement)

The section heading, 1.5.1.5.A, indicates that this triplet pertains to that section in the Specification. (Actually, the section headings in this example correspond to those in the decision table representation of the Specification [1].)

It should be emphasized that the assignment of triplets to the existing design criteria shown in Table 4.1 is tentative and is intended only to be an example of using the computer program developed in this study. Reasonable care and judgment were used, but a more detailed study will be necessary if the Specification Advisory Committee decides to use OUTLINE for a top level organization aid.

A concise listing of all the elements and subelements of the three bases used in the list of triplets in Table 4.1 is shown in Table 4.2. This information was generated as partial output of the OUTLINE program.

Using the input data shown in Table 4.1, the OUTLINE program was used to generate outlines for two possible hierarchical orders of the three bases: (1) components, limit states, stress states, and (2) components, stress states, limit states. The two outlines are given in Tables 4.3 and 4.4, respectively. The outline given in Table 4.3 has slightly less redundancy than the one given in Table 4.4. The order--components, limit states, stress states--seems to be the most logical top level organization for the Specification, because components and limit states are completely exhaustive as discussed in Section 3.1.1. In addition, there usually are more stress states associated with a given limit state than limit states associated with a given stress state; thus, there will be less redundancy if stress states occupy a lower level than limit states in the hierarchical structuring of the bases.

It is apparent that the two orders of bases chosen are the most promising for top level organization of the Specification. However, for the sake of comparison, the outlines corresponding to the other four possible orders of the three bases, i.e., with limit states or stress states as the topmost basis of organization, are included in Appendix A. No discussion of these outlines is presented in this report, and any interpretation or conclusions are left up to the reader.

In the outlines given in Tables 4.3 and 4.4, pertinent section headings of the present Specification appear on the right-hand side of the page and on the same line as the last element or subelement in the triplet. In Table 4.3 the first triplet in the outline is members, thin-walled shapes; yielding; and axial force, tension (i.e., outline Sections 1, 1.1, 1.1.1, 1.1.1.1, and 1.1.1.1.1); and the corresponding section heading in the present Specification is 1.5.1.1.A. The second triplet in the outline is identical except that the last subelement is compression instead of tension (i.e., 1.1.1.1.2 instead of 1.1.1.1.1); there are two sections in the present Specification pertaining to that triplet, 1.5.1.3.A and 2.3.A. Other triplets in the outline in Tables 4.3 and 4.4 can be examined in the same manner.

In both of the example outlines, there are numerous cases where more than one section heading is output alongside a triplet. This occurs in every case where a triplet is associated with more than one of the present criteria listed in Table 2.1. In addition, there are cases where a single section heading is associated with several different triplets in the example outlines. For example, section heading 1.5.1.3.A of the present Specification appears with five different triplets in both of the outlines.

This happens because many of the present criteria cannot be uniquely defined by one triplet.

A satisfactory top level organization of the Specification should provide that each design criterion be uniquely associated with one triplet and that a single triplet apply to only one particular design criterion. Outlines generated according to this scheme would have only one section heading listed with each triplet, and a particular section heading would appear only once in each outline. This concept will be discussed and illustrated in the next section.

4.1.2 Generation of an Outline for a New or Modified Specification

For a new or vastly modified Specification, the input to the OUTLINE program would be a list of all valid triplets corresponding to the criteria to be incorporated in the new Specification. The elements and subelements of the components, limit states, and stress states to be considered in the Specification should be enumerated first, and from this the valid combinations or triplets can be listed. Labels can be included with each triplet to denote the applicable provision for text-writing purposes.

An example of an outline for a modified Specification is given in Tables 4.6 and 4.7. For this example the list of triplets input to the OUTLINE program was modified from the list in Table 4.1 so that each design criterion would be uniquely defined by a single triplet and each triplet would apply to one particular design criterion. The list of triplets used as input is given in Table 4.5 and is the same as the list in Table 4.1, except that all duplicate triplets have been removed. The triplets were tagged with different section headings (identification labels) such as Provisions 1, 2, 3, etc. The same orderings of the bases used in the two previous outlines were used for the outlines in Tables 4.6 and 4.7. Consequently, the outlines in Tables 4.6 and 4.7 are exactly the same as the outlines in Tables 4.3 and 4.4, respectively, except that the section headings appearing with each triplet in the outlines are different. Each section heading appears only once in the outlines in Tables 4.6 and 4.7, and there is only one section heading per triplet.

The outlines in Tables 4.6 and 4.7 represent topical outlines for a new Specification based on the concepts developed in this chapter. Each design criterion would be uniquely tagged with a single triplet, which means that the design criteria are independent of one another. A design criterion could use the same computational formulas or algorithms as other criteria, but would still be independent at the output level.

4.2 Intermediate Level Organization

The intermediate level organization of the Specification discussed in Section 3.2 will serve to organize a single criterion or a set of related criteria and their functional network for direct or conditional execution. A computer program (NETWORK) has been developed in this study to automatically generate a logical network for a criterion or set of criteria. The paths of the network are sorted in the order of shortest to longest path for conditional execution, and in the order of longest to shortest path for direct execution. In addition to sorting by length of paths, related paths are grouped so that they represent subnetworks. Thus, the paths are output in much the same way as they would appear in a graphical display of the network. The program traces out paths in the network by using the information in a file of data items and their direct ingredience lists. This data file is independent of any top level organization of the Specification; it would change only when the content of the Specification is changed.

As an illustration of intermediate level organization by the NETWORK program, the network for the present criterion "Compression Member Check" (TCOMPR) shown in Fig. 2.1 has been organized for direct execution in Section 4.2.1 and for conditional execution in Section 4.2.2.

4.2.1 Direct Execution

As discussed in Section 3.2, direct execution requires that all lower-level provisions be listed before the higher-level ones. The direct execution network for "Compression Member Check" is shown in Table 4.8. The data items given in the example are defined in Table 2.1 and in Appendix C. Examination of Fig. 2.1 shows that the longest chain of interrelated provisions is the one starting at node ABEFF, defining b_e according to Equations C3-1 and C3-2. Thus, this provision would have to be listed first. With b_e known, the effective area of a stiffened element can be computed, then the shape factor, Q_a, etc. In Table 4.8, a single asterisk indicates that the data item has been listed previously, and a double asterisk means that the subnetwork of data items pertinent to that data item has been listed previously and is not repeated to avoid redundancy. In essence, the asterisks represent cross-references needed in the text. The computational steps corresponding to Table 4.8 are shown in Table 4.9 with the indentations indicating the hierarchical levels of data items.

It should be clear that an outline of the type shown above could be used to write a "foolproof," step-by-step procedure for the hierarchical sequence of computations and checks for each criterion. However, several points should be noted in connection with this alternative:

a) the sequence of provisions listed corresponds to the longest path from all ingredient data items to the terminal criterion;

b) as a result of this organization, cross-references always "point to" previously defined data items occurring at lower levels (e.g., the datum "check unstiffened element" at step 14, level 6 involves data items introduced to define Q_s at step 6, level 3; Q_s itself is again used in the computation of F_a at step 9, level 5);

c) from the standpoint of the textual organization, this scheme has a major weakness, namely that the most complex case has to be defined first (in this case, the entire Appendix C of the Specification) before shortcuts can be identified.

4.2.2 Conditional Execution

An alternate possible organization, termed conditional execution, was also discussed in Section 3.2. In this scheme, one proceeds in the diametrically opposite fashion from direct execution by first listing the highest level criterion, and then its immediate ingredients, etc. The conditional execution network for "Compression Member Check" is shown in Table 4.10. The computational steps corresponding to this example are shown in Table 4.11, with the indentations indicating the hierarchical levels of data items.

In comparing the organization shown in Table 4.11 to that given by direct execution, it can be seen that:

a) the sequence of provisions corresponds to the <u>shortest</u> reverse path from the terminal criterion to all ingredient data;

b) cross-references still "point to" previously defined items, but the latter now occur at higher levels, i.e., closer to the terminal datum (compare the relative positions of two data items discussed above);

c) since the organization proceeds from the general to the specific, procedures corresponding to usual cases may be described first, and unusual cases or exceptions treated accordingly.

An attempt has been made to convert the computational steps of Table 4.11 to a complete textual format organized for conditional execution. The provisions used are essentially unchanged from their form in the present Specification, i.e., there has been no reorganization at the detailed level. Only the order of the provisions has been changed from the present Specification to reflect organization for conditional execution. The corresponding textual format is given in Appendix B.

No attempt was made to develop the textual format for check of a compression member organized for direct execution. A direct execution textual format would not be efficient for automatic design checking, nor would it be very suitable for manual usage. If it were desired to write text for direct execution, the provisions would be precisely the same, but organized in an order corresponding to the computational steps of Table 4.9.

4.2.3 Present Intermediate Level Organization of the Specification

The computational steps for "Compression Member Check," as listed in Tables 4.9 and 4.11 for direct and conditional execution have been listed again in Table 4.12 in the general order that they appear in the present AISC Specification. On inspection of this table, it is obvious that the present organization of this particular criterion bears no resemblance to the proposed organization for either direct or conditional execution. The pertinent provisions in the present Specification seem to be so randomly ordered with respect to the proposed intermediate level organizational schemes that it is difficult to make any significant or meaningful comparison.

4.2.4 Intermediate Level Organization in Conjunction with Top Level Organization

Portions or sections of a top level organizational outline can be organized at the intermediate level for direct or conditional execution using the NETWORK program. The single design criterion or set of related design criteria appearing in the section under consideration serves as the input for the problem.

In Tables 4.13 and 4.15, the set of design criteria found in Part 2 of the topical outlines shown in Tables 4.3 and 4.4 ("Elements of Members") have been organized for direct and conditional execution. These design criteria are given as section headings alongside the triplets, i.e., 1.5.1.5.A, 1.10.5.1.A, 1.10.5.2.A, 1.10.5.2.B, 1.10.5.2.C, and 1.10.10.A. The corresponding names of the design criteria are given in Table 2.1, and the data items making up the functional network are defined in Appendix C. The computational steps corresponding to direct and conditional execution of these design criteria are shown in Tables 4.14 and 4.16, respectively. No attempt was made to convert the computational steps to text, because of inconsistencies discussed later in Section 4.2.5.

The topical outlines used have multiple section headings, and a section heading may appear more than once in the outline. Thus, the functional network generated for a section of the outline is not unique to that part alone. It is important to note that intermediate level organization would be more useful in the case where each design criterion is uniquely defined by one triplet, as in Examples 4.3 and 4.4. In that case, it would be necessary to generate a functional network for the new set of criteria before any intermediate level organization would be done.

4.2.5 Effect of the Network Model on Intermediate Level Organization

The logical network of design criteria and their ingredients is actually a model chosen for automatic intermediate level organization. Obviously, any organization based on the model is subject to any inconsistencies or limitations inherent in the model. In this section, such cases will be briefly discussed.

The NETWORK program described previously and its underlying concepts have one serious shortcoming in that the program treats common and dynamic ingredients alike in generating outlines. The dynamic ingredients, which relate to the "if-then" conditions of the decision tables, have major effect on the possible textual formats, which is not exploited by the present program. For example, the network for "Compression Member Check" in Fig. 2.1 includes the boolean data item "Appendix C Desired?" (denoted by BAPDXC). If a designer does not wish to use Appendix C, i.e., it is known that BAPDXC = "NO," then it will not be necessary to compute those items pertaining exclusively to Appendix C, e.g., Q_s, Q_a, and b_e. The networks sorted for direct and conditional execution in Tables 4.8 and 4.10 (or presented as step-by-step outlines in Tables 4.9 and 4.11) show that the data items used in Appendix C are given a position in the network (or outline) based on length of path or level from output. However, it can be anticipated that many designers will choose not to use Appendix C. Thus, it seems that the intermediate level organizational scheme should allow for separation of particular provisions or subnetworks requiring special consideration.

Another difficulty with the NETWORK program is that it does not group together subnetworks that are related as to type of design check, but yet quite different with respect to the data items required as ingredients. For example, the intermediate level organization of the group of design criteria shown in Tables 4.13 through 4.16 is again done according to length of path or level from output; consequently, the design criteria to be checked are intermixed. More specifically, in Table 4.16, the type of design criteria to be checked in the order of conditional execution are: shear, compression, bearing, shear, compression, and shear. This order is reversed for direct execution in Table 4.14. It would be desirable to modify NETWORK so that it is capable of grouping all the criteria for shear, compression, etc., in addition to sorting by length of path.

The structuring of data in the Specification plays an important role in the intermediate level organization. There are several possible means of structuring the data. For computational efficiency, often used quantities, such as $K\ell/r$, should be considered distinct data items. On the other hand, for a compact data structure, only the independent quantities, such as K, ℓ, and r, should be stored. However, in order to display a step-by-step logical procedure for text-writing purposes, it may be necessary to consider all conditions involving boolean tests as separate data items. For instance, the conditional tests, "$K\ell/r \leq C_c$" or "$K\ell/r \leq 200$," could be treated as separate data items. The obvious disadvantage in this data storage plan is that the size of the data structure is increased immensely.

As is true with developing any model, inconsistencies and limitations do not become well-defined until a trial version of the model is developed and its behavior analyzed. It is expected that the difficulties with the model for intermediate level organization will be resolved in future studies. The NETWORK program can be improved to ease the task of choosing the best textual format, but undoubtedly cases will arise where the final choice will have to be made by the Specification Advisory Committee.

4.3 Detailed Level Organization

The detailed organization of paragraphs or sections of the text can be made using the decision table representation of the Specification [1]. As discussed in Section 3.3, the immediate or delayed decision logic can be used to convert the decision tables into a format for textual expression.

As an example of the structuring techniques available, a single paragraph of the present Specification will be used.

Section 1.10.2 currently reads: "The clear distance between flanges, in inches, shall not exceed

$$d: \frac{14,000}{\sqrt{F_y(F_y + 16.5)}}$$

times the web thickness, where F_y is the yield stress of the compression flange, except that it need not be less than $2,000/F_y$ when transverse stiffeners are provided, spaced not more than $1\frac{1}{2}$ times the girder depth." Assuming that "it" in the third line refers to d/t, a possible resulting decision table is:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Transverse stiffeners provided	N	N	Y	Y	Y	Y	Y
Stiffener spacing $\leq$ 1.5d			Y	Y	Y	N	N
$\frac{d}{t} \leq \frac{14,000}{\sqrt{F_y(F_y + 16.5)}}$	Y	N	Y	N	N	Y	N
$\frac{d}{t} \leq \frac{2000}{\sqrt{F_y}}$				Y	N		
Section 1.10.2 satisfied	Y		Y	Y		Y	
Section 1.10.2 not satisfied		Y			Y		Y

4.3.1 Delayed Decision Logic

The delayed decision logic attempts to break the decision table into two nearly equal halves. In this case, exact halving is not possible, but the first two conditions separate the table into three parts of roughly the same number of rules. The text corresponding to that logic might read:

Rules (1) - (2): "If no transverse stiffeners are provided, the clear distance between flanges shall not exceed that given by

$$d = \frac{14,000t}{\sqrt{F_y(F_y + 16.5)}} \qquad (a)$$

Rules (3) - (5): "If transverse stiffeners are provided, and their spacing is not more than $1\frac{1}{2}$ times the girder depth, the clear distance either shall not exceed that given by (a), or shall not exceed that given by

$$d = \frac{2000t}{F_y} \qquad (b)$$

Rules (6) - (7): "If transverse stiffeners are provided, but their spacing exceeds $1\frac{1}{2}$ times the girder depth, the clear distance shall not exceed that given by (a)."

The repetitive nature of the text is obvious.

4.3.2 Immediate Decision Logic

The immediate decision logic attempts to isolate as soon as possible a given rule (presumably, the most frequent ones first). The corresponding text may be more readily generated if the previous table is condensed, by recognizing that rules (1), (3) and (6) can be combined into one (the first three conditions of rules (3) and (6), namely {Y Y Y} and {Y N Y} combine into a single rule {Y I Y}, and this new rule, combined with the {N I Y} of rule (1) yields a single rule {I I Y}). The resultant decision table is:

	(1,3,6)	(4)	(2)	(5)	(7)
Transverse stiffeners provided		Y	N	Y	Y
Stiffener spacing $\leq$ 1.5d		Y		Y	N
$\frac{d}{t} \leq \frac{14,000}{\sqrt{F_y(F_y + 16.5)}}$	Y	N	N	N	N
$\frac{d}{t} \leq \frac{2000}{\sqrt{F_y}}$		Y		N	
Section 1.10.2 satisfied	Y	Y			
Section 1.10.2 not satisfied			Y	Y	Y

The text may now read:

"The clear distance between flanges shall not exceed that given by (a) (Rules (1),(3), (6)), except that if transverse stiffeners, spaced not more than $1\frac{1}{2}$ times the girder depth, are provided, the distance need not be less than that given by (b) (Rule (4)).

This sentence reads very much like the present one, except for the clarification of the predicate "it" and the shift in sentence structure to make the conditional clause "spaced not more than $1\frac{1}{2}$ times the girder depth" properly qualify the higher-level conditional clause "transverse stiffeners are provided."

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

An abstract model of the AISC Specification has been developed in this study. The Specification consists of a collection of design criteria along with a hierarchical sequence of computations, checks, formulas, limits, etc., and can be represented independently of its textual representation by a graph or logical network. The grouping and ordering of the criteria in the Specification may be represented by a second, or organizational, network so as to provide a logical and consistent entry to the various criteria which must be evaluated according to the Specification.

The format of the text of the Specification must be viewed at three levels: (1) top level, (2) intermediate level, and (3) detailed level. The top level provides the overall organization of the text by hierarchically structuring independent bases for grouping the design criteria. The intermediate level provides for organization of the functional network used in evaluation of a particular criterion or set of criteria. The functional network can be organized for conditional or direct execution. Detailed level organization of specific sections or paragraphs of the text can be obtained by organizing individual decision tables for delayed decision or immediate decision logic.

In this study aids have been presented for organizing the AISC Specification at the top level, intermediate level, and detailed level. The top level organization, consisting of overall topical outlines, can be generated by hierarchically structuring the three major independent bases using the OUTLINE computer program. Another computer program, NETWORK, can be used to organize a single criterion or group of criteria and their functional network for direct or conditional execution. Detailed level organization of paragraphs or sections of the text can be based on the algorithms for immediate or delayed decision processing of decision tables.

5.2 Scenario for Future Specification Development

The concept that the text of the Specification can be closely related to its logical structure has permitted substantial computer aids to the Specification Advisory Committee in developing the textual organization. It is envisioned that future changes or reorganization of the Specification will be processed as follows:

a) the provisions, concepts, changes, etc., will be submitted to the Advisory Committee for discussion and conceptual approval;

b) the approved provisions and concepts will be written as decision tables to explicitly describe the logic and to screen out inconsistencies, omissions, etc.;

c) the logical network for the Specification will be generated from the decision tables, and their overall implications and connections will be evaluated;

d) a top level organizational scheme as discussed in Section 3.1 will be used to generate a topical outline for the Specification;

e) an intermediate level organization for either conditional or direct execution as described in Section 3.2 will be made based on the logical network; and

f) the detailed text will be written from the decision tables corresponding to an immediate or delayed decision rule as given in Section 3.3.

5.3 Suggestions for Future Work

Methods and aids for organizing the Specification have been presented in Chapters 3 and 4. Intermediate level and detailed level organization can be applied as demonstrated in Sections 4.2 and 4.3. However, there is a major drawback in applying the aid for top level organization. The problem is that the present criteria are not defined in a sufficiently formal manner to allow a consistent and unambiguous treatment. This particular problem, along with specific application of the organizational tools to the present Specification, is the basis for suggested future work. It is recommended that a representative subset of the Specification be selected and the concepts developed in this study applied to it. A possible subset may consist of the provisions for columns, beams, and beam-columns in Parts 1 and 2 of the present Specification, and the corresponding provisions from the Load Factor study by Galambos [5].

The suggested work could be conducted in the following three stages:

1) The design criteria in the selected subset of the Specification can be decomposed into basic criteria. For example, the criterion for check of a member in bending can be decomposed into the basic criteria for check for yielding, lateral-torsional instability, and local instability. Each of the basic criteria in this subset would then be "tagged" to denote which limit state, stress state, or type of component it pertains to. Decomposing a

general design criterion requires a detailed study so as to isolate the appropriate basic criteria that can be uniquely defined by only one triplet.

(2) The NETWORK program should be improved so as to remove the limitations and inconsistencies discussed previously in Section 4.2.5. The two computer programs developed in this study can then be combined to process the selected subset of criteria. The resulting combined program should have the capability of taking a specified hierarchical sequence of triplets as input, and then output a top-level outline of the subset of the Specification along with the appropriate section headings. In addition, all of the parameters, computational steps, etc., needed to evaluate the basic criteria should be output for direct execution or conditional execution to serve as the intermediate-level organization. A close examination should be made of dynamic ingredience relationships in the functional network, as this concept was not explored in the present study. The program developed in this second stage will allow writers of the Specification to investigate various alternative top and intermediate level organizations with very little manual effort.

3) The program discussed in stage 2 is conceived as an aid for producing textual organizations. Therefore, it has the limitation of referring to a single component, limit state, or stress state at any time. As a third stage of study, this algorithm could be expanded to control the actual computations. This would require including the concepts of subscripted data as discussed in Ref. 3. Subscripting the input data and the output allows the user to work with particular members in a structure, particular stations within a member, etc. Once this algorithm can handle subscripted input and parameters, it will be a prototype for interaction between generalized analysis and design programs.

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Table 2.1, Design Criteria in Present Specification

Section	Criterion	Level from Input
1.5.1.1.A	Tension Check	7
1.5.1.2.A	Shear Check	3
1.5.1.3.A	Compression Member Check	8
1.5.1.4.A	Bending Check	7
1.5.1.5.A	Bearing Check	3
1.5.2.A	Check of Tension Stress in Connector	4
1.5.2.B	Check of Shear Stress in Connector	5
1.5.2.C	Check of Bearing Stress in Connector	4
1.5.3.A	Stress Check in Welded Connections	4
1.5.5.A	Check of Masonry Bearing	3
1.6.1.A	Check of Combined Stress (Compression and Bending)	9
1.6.1.B	Check of Combined Stress (Compression and Bending, RA.LE.0.15)	8
1.6.2.A	Check of Combined Stress (Tension and Bending)	7
1.6.3.A	Check of Combined Stress in Connector	5
1.10.5.1.A	Compression (Bearing Stiffeners) Check	4
1.10.5.2.A	Check of Shear on Beams/Girders	2
1.10.5.2.B	Check of Shear on Hybrid/A514 Steel Girder	4
1.10.5.2.C	Check of Shear on Beams/Girders with Stiffeners	7
1.10.10.A	Check of Compression (Web Toe of Fillet)	3
1.11.2.1.A	Check of Encased Composite Beams	3
1.11.2.2.A	Check of Non-Encased Composite Beam	6
1.15.A	Connection Check	8
1.15.B	Heterogeneous Connection	1
1.16.A	Check of Geometrical Requirements	7
1.17.A	Geometry Check on Welded Connections	3
2.3.A	Check of Vertical Bracing	2
2.4.A	Member Check (Plastic Design)	5
2.9.A	Check of Lateral Bracing	10

Table 2.2, Reformulation of Decision Table 1.5.1.3.a

ORIGINAL DECISION TABLE

	Main Member	Y	Y	N	N	N	N	E
	Bracing/Secondary Member	N	N	Y	Y	Y	Y	
	$K\ell/r \leq C_c$	Y	N	Y	Y	N	N	
	$\ell/r > 120$	I	I	Y	N	Y	N	
(1)	$f_a = P/A_g$	Y	Y	Y	Y	Y	Y	
(2)	F_a = Formula C5-1	Y		Y	Y			
(2)	F_a = Formula 1.5-2		Y			Y	Y	
(3)	F'_a = Formula 1.5-3			Y		Y		
(3)	$F'_a = F_a$	Y	Y		Y		Y	
(4)	$R_a = f_a/F'_a$	Y	Y	Y	Y	Y	Y	
	Else Rule							Y

Table 2.2 (Continued)

New Function 1.5.1.3.a.1

$$f_a = P/A_g$$

New Decision Table 1.5.1.3.a.2

$K\ell/r \leq C_c$	Y	N
F_a = Formula C5-1	Y	
F_a = Formula 1.5-2		Y

New Decision Table 1.5.1.3.a.3

Bracing/Secondary Member	N	Y	Y
$\ell/r > 120$	I	Y	N
F'_a = Formula 1.5-3		Y	
$F'_a = F_a$	Y		Y

New Function 1.5.1.3.a.4

$$R_a = f_a/F'_a$$

Table 3.1, Bases of Section of 1969 Specification

		Philosophy	Limit State	Component	Procedure	Stress State
Part 1						
1.1	Plans and Drawings				X	
1.2	Types of Construction	X			X	
1.3	Loads and Forces				X	
1.4	Material					
1.5	Allowable Stresses	X	X	X		X
1.6	Combined Stresses	X	X	X		X
1.7	Fatigue	X	X	X		X
1.8	Slenderness Ratios	X	X	X		X
1.9	Width Thickness Ratios	X	X	X		X
1.10	Plate Girders and Rolled Beams	X	X	X		X
1.11	Composite Construction	X	X	X		X
1.12	Simple and Continuous Spans	X	X	X		X
1.13	Deflections, Vibrations, and Ponding	X	X	X		X
1.14	Gross and Net Sections		X	X		X
1.15	Connections	X	X	X		X
1.16	Rivets and Bolts		X	X		X
1.17	Welds		X	X		X
1.18	Built-up Members		X	X		X
1.19	Camber			X	X	
1.20	Expansion		X			
1.21	Column Bases			X	X	X
1.22	Anchor Bolts			X		X
1.23	Fabrication		X	X	X	X
1.24	Shop Painting				X	
1.25	Erection				X	
1.26	Quality Control				X	
Part 2						
2.1	Scope	X	X			
2.2	Structural Steel	X	X			
2.3	Vertical Bracing Systems	X	X	X		X
2.4	Columns	X	X	X		X
2.5	Shear	X	X			X
2.6	Web Crippling	X	X	X		X
2.7	Minimum Thickness	X	X			X
2.8	Connections	X	X			X
2.9	Lateral Bracing	X	X	X		X
2.10	Fabrication	X		X		

Table 4.1, Triplet Vectors Used as Input for Generating the Outlines in Tables 4.3 and 4.4 and Appendix A

THE FOLLOWING TABLE CONTAINS A LISTING OF TRIPLETS USED AS INPUT TO THE OUTLINE PROGRAM. THE SECTION HEADING FOR A TRIPLET WILL APPEAR WITH THE TRIPLET IN THE OUTLINE GENERATED.

	COMPONENTS		LIMIT STATES		STRESS STATES		SECTION
	ELEMENT	SUBELEMENT	ELEMENT	SUBELEMENT	ELEMENT	SUBELEMENT	HEADING
1.	CONNECTOR	PINS	YIELDING	---	BEARING	---	1.5.1.5.A
2.	CONNECTOR	ROLLER/ROCKER	YIELDING	---	BEARING	---	1.5.1.5.A
3.	ELEM. OF MEMB.	BRG STIFFENERS	YIELDING	---	BEARING	---	1.5.1.5.A
4.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	FLEXURAL FORCE	---	1.5.1.4.A
5.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	FLEXURAL FORCE	---	1.5.1.4.A
6.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	FLEXURAL FORCE	---	1.5.1.4.A
7.	MEMBERS	SOLID SHAPES	YIELDING	---	FLEXURAL FORCE	---	1.5.1.4.A
8.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	FLEXURAL FORCE	---	1.5.1.4.A
9.	ELEM. OF MEMB.	BRG STIFFENERS	YIELDING	---	BEARING	---	1.10.5.1.A
10.	ELEM. OF MEMB.	BRG STIFFENERS	INSTABILITY	GLOBAL	BEARING	---	1.10.5.1.A
11.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	AXIAL FORCE	COMPRESSION	1.5.1.3.A
12.	MEMBERS	SOLID SHAPES	YIELDING	---	AXIAL FORCE	COMPRESSION	1.5.1.3.A
13.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.5.1.3.A
14.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	AXIAL FORCE	COMPRESSION	1.5.1.3.A
15.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.5.1.3.A
16.	CONNECTIONS	---	YIELDING	---	AXIAL FORCE	COMPRESSION	1.5.1.3.A
17.	CONNECTIONS	---	YIELDING	---	AXIAL FORCE	TENSION	1.15.A
18.	CONNECTIONS	---	YIELDING	---	AXIAL FORCE	COMPRESSION	1.15.A
19.	CONNECTIONS	---	YIELDING	---	FLEXURAL FORCE	---	1.15.A
20.	CONNECTIONS	---	YIELDING	---	SHEARING FORCE	---	1.15.A
21.	CONNECTIONS	---	YIELDING	---	TORSIONAL FORCE	---	1.15.A
22.	CONNECTIONS	---	YIELDING	---	BEARING	---	1.15.A
23.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	COMBINED FORCES	SHEAR+BENDING	1.15.A
24.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	COMPR+BENDING	1.6.1.A
25.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	1.6.1.A
26.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	COMBINED FORCES	COMPR+BENDING	1.6.1.A
27.	MEMBERS	SOLID SHAPES	YIELDING	---	COMBINED FORCES	COMPR+BENDING	1.6.1.A
28.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	1.6.1.A
29.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	COMPR+BENDING	1.6.1.B
30.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	1.6.1.B
31.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	COMBINED FORCES	COMPR+BENDING	1.6.1.B
32.	MEMBERS	SOLID SHAPES	YIELDING	---	COMBINED FORCES	COMPR+BENDING	1.6.1.B
33.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	COMPR+BENDING	1.6.1.B
34.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	COMBINED FORCES	TENSION+BENDING	1.6.2.A
35.	MEMBERS	SOLID SHAPES	YIELDING	---	COMBINED FORCES	TENSION+BENDING	1.6.2.A
36.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	COMBINED FORCES	TENSION+BENDING	1.6.2.A
37.	ELEM. OF MEMB.	BM/GRDR WEB	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.10.10.A
38.	MEMBERS	ENCASED COMP.	YIELDING	---	AXIAL FORCE	COMPRESSION	1.10.10.A
39.	CONNECTOR	BOLTS	YIELDING	---	FLEXURAL FORCE	---	1.11.2.1.A
40.	CONNECTOR	BOLTS	YIELDING	---	SHEARING FORCE	---	1.16.A
41.	CONNECTOR	RIVETS	YIELDING	---	BEARING	---	1.16.A
42.	CONNECTOR	RIVETS	YIELDING	---	SHEARING FORCE	---	1.16.A
43.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	BEARING	---	1.16.A
44.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	FLEXURAL FORCE	---	2.9.A
45.	CONNECTOR	BEARING SURFACE	YIELDING	---	FLEXURAL FORCE	---	2.9.A
					BEARING	---	1.5.5.A

Table 4.1. Continued

	COMPONENTS ELEMENT	COMPONENTS SUBELEMENT	LIMIT STATES ELEMENT	LIMIT STATES SUBELEMENT	STRESS STATES ELEMENT	STRESS STATES SUBELEMENT	SECTION HEADING
46.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	2.4.A
47.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	2.4.A
48.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	2.4.A
49.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	2.4.A
50.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	AXIAL FORCE	COMPRESSION	2.4.A
51.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	COMPR+BENDING	2.4.A
52.	CONNECTOR	SHEAR CONNECTOR	YIELDING	---	SHEARING FORCE	---	1.11.2.2.A
53.	MEMBERS	NON-ENC. COMP.	YIELDING	---	FLEXURAL FORCE	---	1.11.2.2.A
54.	MEMBERS	NON-ENC. COMP.	INSTABILITY	LOCAL	FLEXURAL FORCE	---	1.11.2.2.A
55.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	SHEARING FORCE	---	1.10.5.2.B
56.	ELEM. OF MEMB.	BM/GRDR WEB	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.10.5.2.B
57.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	SHEARING FORCE	---	1.10.5.2.C
58.	ELEM. OF MEMB.	BM/GRDR WEB	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.10.5.2.C
59.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	SHEARING FORCE	---	1.10.5.2.A
60.	ELEM. OF MEMB.	BM/GRDR WEB	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	1.10.5.2.A
61.	CONNECTOR	GROOVE WELD	YIELDING	---	SHEARING FORCE	---	1.5.3.A
62.	CONNECTOR	GROOVE WELD	YIELDING	---	AXIAL FORCE	TENSION	1.5.3.A
63.	CONNECTOR	GROOVE WELD	YIELDING	---	AXIAL FORCE	COMPRESSION	1.5.3.A
64.	CONNECTOR	PLUG/SLOT WELD	YIELDING	---	SHEARING FORCE	---	1.5.3.A
65.	CONNECTOR	FILLET WELD	YIELDING	---	SHEARING FORCE	---	1.5.3.A
66.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	SHEARING FORCE	---	1.5.1.2.A
67.	MEMBERS	SOLID SHAPES	YIELDING	---	SHEARING FORCE	---	[illegible].5.1.2.A
68.	CONNECTOR	RIVETS	YIELDING	---	BEARING	---	1.5.2.C
69.	CONNECTOR	BOLTS	YIELDING	---	BEARING	---	1.5.2.C
70.	CONNECTOR	RIVETS	YIELDING	---	SHEARING FORCE	---	1.6.3.A
71.	CONNECTOR	RIVETS	YIELDING	---	AXIAL FORCE	TENSION	1.6.3.A
72.	CONNECTOR	BOLTS	YIELDING	---	SHEARING FORCE	---	1.6.3.A
73.	CONNECTOR	BOLTS	YIELDING	---	AXIAL FORCE	TENSION	1.6.3.A
74.	CONNECTOR	RIVETS	YIELDING	---	SHEARING FORCE	---	1.5.2.B
75.	CONNECTOR	BOLTS	YIELDING	---	SHEARING FORCE	---	1.5.2.B
76.	CONNECTOR	RIVETS	YIELDING	---	AXIAL FORCE	TENSION	1.5.2.A
77.	CONNECTOR	BOLTS	YIELDING	---	AXIAL FORCE	TENSION	1.5.2.A
78.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	AXIAL FORCE	TENSION	1.5.1.1.A
79.	MEMBERS	SOLID SHAPES	YIELDING	---	AXIAL FORCE	TENSION	1.5.1.1.A
80.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	AXIAL FORCE	COMPRESSION	2.3.A
81.	MEMBERS	SOLID SHAPES	YIELDING	---	AXIAL FORCE	COMPRESSION	2.3.A
82.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	2.3.A
83.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	2.3.A
84.	CONNECTOR	FILLET WELD	YIELDING	---	SHEARING FORCE	---	1.17.A

Table 4.2, Elements and Subelements used in the Triplets of Table 4.1

ELEMENTS AND SUBELEMENTS OF THE THREE MAJOR BASES
USED IN THE TRIPLETS INPUT TO THE OUTLINE PROGRAM

I. COMPONENTS
   A. MEMBERS
      1. THIN-WALL SHAPE
      2. SOLID SHAPES
      3. ENCASED COMP.
      4. NON-ENC. COMP.
   B. ELEM. OF MEMB.
      1. BRG STIFFENERS
      2. BM/GRDR WEB
   C. CONNECTIONS
   D. CONNECTOR
      1. BOLTS
      2. RIVETS
      3. GROOVE WELD
      4. PLUG/SLOT WELD
      5. FILLET WELD
      6. SHEAR CONNECTOR
      7. BEARING SURFACE
      8. PINS
      9. ROLLER/ROCKER

II. LIMIT STATES
   A. YIELDING
   B. INSTABILITY
      1. GLOBAL
      2. LOCAL

III. STRESS STATES
   A. AXIAL FORCE
      1. TENSION
      2. COMPRESSION
   B. FLEXURAL FORCE
   C. SHEARING FORCE
   D. TORSIONAL FORCE
   E. BEARING
   F. COMBINED FORCES
      1. COMPR+BENDING
      2. TENSION+BENDING
      3. SHEAR+BENDING

Table 4.3, Top Level Outline for Present Specification (Components, Limit States, Stress States)

SPECIFICATION OUTLINE ARRANGED BY

COMPONENTS
LIMIT STATES
STRESS STATES

1. MEMBERS			
1.1 THIN-WALL SHAPE			
1.1.1 YIELDING			
1.1.1.1 AXIAL FORCE			
1.1.1.1.1 TENSION	1.5.1.1.A		
1.1.1.1.2 COMPRESSION	1.5.1.3.A	2.3.A	
1.1.1.2 FLEXURAL FORCE	1.5.1.4.A		
1.1.1.3 SHEARING FORCE	1.5.1.2.A		
1.1.1.4 COMBINED FORCES			
1.1.1.4.1 COMPR+BENDING	1.6.1.A	1.6.1.B	
1.1.1.4.2 TENSION+BENDING	1.6.2.A		
1.1.2 INSTABILITY			
1.1.2.1 GLOBAL			
1.1.2.1.1 AXIAL FORCE			
COMPRESSION	1.5.1.3.A	2.4.A	2.3.A
1.1.2.1.2 FLEXURAL FORCE	1.5.1.4.A	2.9.A	
1.1.2.1.3 COMBINED FORCES			
COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A
1.1.2.2 LOCAL			
1.1.2.2.1 AXIAL FORCE			
COMPRESSION	1.5.1.3.A	2.4.A	
1.1.2.2.2 FLEXURAL FORCE	1.5.1.4.A		
1.1.2.2.3 COMBINED FORCES			
1.1.2.2.3.1 COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A
1.1.2.2.3.2 TENSION+BENDING	1.6.2.A		
1.2 SOLID SHAPES			
1.2.1 YIELDING			
1.2.1.1 AXIAL FORCE			
1.2.1.1.1 TENSION	1.5.1.1.A		
1.2.1.1.2 COMPRESSION	1.5.1.3.A	2.3.A	
1.2.1.2 FLEXURAL FORCE	1.5.1.4.A		
1.2.1.3 SHEARING FORCE	1.5.1.2.A		
1.2.1.4 COMBINED FORCES			
1.2.1.4.1 COMPR+BENDING	1.6.1.A	1.6.1.B	
1.2.1.4.2 TENSION+BENDING	1.6.2.A		
1.2.2 INSTABILITY			
GLOBAL			
1.2.2.1 AXIAL FORCE			
COMPRESSION	1.5.1.3.A	2.4.A	2.3.A
1.2.2.2 FLEXURAL FORCE	1.5.1.4.A	2.9.A	
1.2.2.3 COMBINED FORCES			
COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A
1.3 ENCASED COMP.			
YIELDING			
FLEXURAL FORCE	1.11.2.1.A		
1.4 NON-ENC. COMP.			
1.4.1 YIELDING			
FLEXURAL FORCE	1.11.2.2.A		
1.4.2 INSTABILITY			
LOCAL			
FLEXURAL FORCE	1.11.2.2.A		
2. ELEM. OF MEMB.			
2.1 BRG STIFFENERS			
2.1.1 YIELDING			
BEARING	1.5.1.5.A	1.10.5.1.A	

Table 4.3, Continued

2.1.2 INSTABILITY				
GLOBAL				
BEARING	1.10.5.1.A			
2.2 BM/GRDR WEB				
2.2.1 YIELDING				
2.2.1.1 AXIAL FORCE				
COMPRESSION	1.10.10.A			
2.2.1.2 SHEARING FORCE	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A	
2.2.2 INSTABILITY				
GLOBAL				
AXIAL FORCE				
COMPRESSION	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
3. CONNECTIONS				
YIELDING				
3.1 AXIAL FORCE				
3.1.1 TENSION	1.15.A			
3.1.2 COMPRESSION	1.15.A			
3.2 FLEXURAL FORCE	1.15.A			
3.3 SHEARING FORCE	1.15.A			
3.4 TORSIONAL FORCE	1.15.A			
3.5 BEARING	1.15.A			
3.6 COMBINED FORCES				
SHEAR+BENDING	1.15.A			
4. CONNECTOR				
4.1 BOLTS				
YIELDING				
4.1.1 AXIAL FORCE				
TENSION	1.6.3.A	1.5.2.A		
4.1.2 SHEARING FORCE	1.16.A	1.6.3.A	1.5.2.B	
4.1.3 BEARING	1.16.A	1.5.2.C		
4.2 RIVETS				
YIELDING				
4.2.1 AXIAL FORCE				
TENSION	1.6.3.A	1.5.2.A		
4.2.2 SHEARING FORCE	1.16.A	1.6.3.A	1.5.2.B	
4.2.3 BEARING	1.16.A	1.5.2.C		
4.3 GROOVE WELD				
YIELDING				
4.3.1 AXIAL FORCE				
4.3.1.1 TENSION	1.5.3.A			
4.3.1.2 COMPRESSION	1.5.3.A			
4.3.2 SHEARING FORCE	1.5.3.A			
4.4 PLUG/SLOT WELD				
YIELDING				
SHEARING FORCE	1.5.3.A			
4.5 FILLET WELD				
YIELDING				
SHEARING FORCE	1.5.3.A	1.17.A		
4.6 SHEAR CONNECTOR				
YIELDING				
SHEARING FORCE	1.11.2.2.A			
4.7 BEARING SURFACE				
YIELDING				
BEARING	1.5.5.A			
4.8 PINS				
YIELDING				
BEARING	1.5.1.5.A			
4.9 ROLLER/ROCKER				
YIELDING				
BEARING	1.5.1.5.A			

Table 4.4, Top Level Outline for Present Specification (Components, Stress States, Limit States)

SPECIFICATION OUTLINE ARRANGED BY

COMPONENTS
  STRESS STATES
    LIMIT STATES

1. MEMBERS			
1.1 THIN-WALL SHAPE			
1.1.1 AXIAL FORCE			
1.1.1.1 TENSION			
YIELDING	1.5.1.1.A		
1.1.1.2 COMPRESSION			
1.1.1.2.1 YIELDING	1.5.1.3.A	2.3.A	
1.1.1.2.2 INSTABILITY			
1.1.1.2.2.1 GLOBAL	1.5.1.3.A	2.4.A	2.3.A
1.1.1.2.2.2 LOCAL	1.5.1.3.A	2.4.A	
1.1.2 FLEXURAL FORCE			
1.1.2.1 YIELDING	1.5.1.4.A		
1.1.2.2 INSTABILITY			
1.1.2.2.1 GLOBAL	1.5.1.4.A	2.9.A	
1.1.2.2.2 LOCAL	1.5.1.4.A		
1.1.3 SHEARING FORCE			
YIELDING	1.5.1.2.A		
1.1.4 COMBINED FORCES			
1.1.4.1 COMPR+BENDING			
1.1.4.1.1 YIELDING	1.6.1.A	1.6.1.B	
1.1.4.1.2 INSTABILITY			
1.1.4.1.2.1 GLOBAL	1.6.1.A	1.6.1.B	2.4.A
1.1.4.1.2.2 LOCAL	1.6.1.A	1.6.1.B	2.4.A
1.1.4.2 TENSION+BENDING			
1.1.4.2.1 YIELDING	1.6.2.A		
1.1.4.2.2 INSTABILITY			
LOCAL	1.6.2.A		
1.2 SOLID SHAPES			
1.2.1 AXIAL FORCE			
1.2.1.1 TENSION			
YIELDING	1.5.1.1.A		
1.2.1.2 COMPRESSION			
1.2.1.2.1 YIELDING	1.5.1.3.A	2.3.A	
1.2.1.2.2 INSTABILITY			
GLOBAL	1.5.1.3.A	2.4.A	2.3.A
1.2.2 FLEXURAL FORCE			
1.2.2.1 YIELDING	1.5.1.4.A		
1.2.2.2 INSTABILITY			
GLOBAL	1.5.1.4.A	2.9.A	
1.2.3 SHEARING FORCE			
YIELDING	1.5.1.2.A		
1.2.4 COMBINED FORCES			
1.2.4.1 COMPR+BENDING			
1.2.4.1.1 YIELDING	1.6.1.A	1.6.1.B	
1.2.4.1.2 INSTABILITY			
GLOBAL	1.6.1.A	1.6.1.B	2.4.A
1.2.4.2 TENSION+BENDING			
YIELDING	1.6.2.A		
1.3 ENCASED COMP.			
FLEXURAL FORCE			
YIELDING	1.11.2.1.A		
1.4 NON-ENC. COMP.			
FLEXURAL FORCE			
1.4.1 YIELDING	1.11.2.2.A		
1.4.2 INSTABILITY			

Table 4.4, Continued

LOCAL	1,11.2.2.A			
2. ELEM. OF MEMB.				
2,1 BRG STIFFENERS				
BEARING				
2.1.1 YIELDING	1,5.1.5.A	1.10.5.1.A		
2.1.2 INSTABILITY				
GLOBAL	1,10.5.1.A			
2,2 BM/GRDR WEB				
2,2.1 AXIAL FORCE				
COMPRESSION				
2.2.1.1 YIELDING	1,10,10.A			
2.2.1.2 INSTABILITY				
GLOBAL	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
2.2.2 SHEARING FORCE				
YIELDING	1,10.5.2.B	1.10.5.2.C	1.10.5.2.A	
3. CONNECTIONS				
3,1 AXIAL FORCE				
3.1.1 TENSION				
YIELDING	1,15.A			
3.1.2 COMPRESSION				
YIELDING	1,15.A			
3,2 FLEXURAL FORCE				
YIELDING	1,15.A			
3,3 SHEARING FORCE				
YIELDING	1,15.A			
3,4 TORSIONAL FORCE				
YIELDING	1,15.A			
3,5 BEARING				
YIELDING	1,15.A			
3,6 COMBINED FORCES				
SHEAR+BENDING				
YIELDING	1,15.A			
4. CONNECTOR				
4,1 BOLTS				
4.1.1 AXIAL FORCE				
TENSION				
YIELDING	1.6.3.A	1.5.2.A		
4.1.2 SHEARING FORCE				
YIELDING	1.16.A	1.6.3.A	1.5.2.B	
4.1.3 BEARING				
YIELDING	1.16.A	1.5.2.C		
4,2 RIVETS				
4.2.1 AXIAL FORCE				
TENSION				
YIELDING	1.6.3.A	1.5.2.A		
4.2.2 SHEARING FORCE				
YIELDING	1.16.A	1.6.3.A	1.5.2.B	
4.2.3 BEARING				
YIELDING	1.16.A	1.5.2.C		
4,3 GROOVE WELD				
4.3.1 AXIAL FORCE				
4.3.1.1 TENSION				
YIELDING	1.5.3.A			
4.3.1.2 COMPRESSION				
YIELDING	1.5.3.A			
4.3.2 SHEARING FORCE				
YIELDING	1.5.3.A			
4,4 PLUG/SLOT WELD				
SHEARING FORCE				
YIELDING	1.5.3.A			
4,5 FILLET WELD				
SHEARING FORCE				

Table 4.4, Continued

	YIELDING	1.5.3.A	1.17.A
4.6	SHEAR CONNECTOR		
	SHEARING FORCE		
	YIELDING	1.11.2.2.A	
4.7	BEARING SURFACE		
	BEARING		
	YIELDING	1.5.5.A	
4.8	PINS		
	BEARING		
	YIELDING	1.5.1.5.A	
4.9	ROLLER/ROCKER		
	BEARING		
	YIELDING	1.5.1.5.A	

Table 4.5, Triplet Vectors used as Input for Generating the Outlines in Tables 4.6 and 4.7

THE FOLLOWING TABLE CONTAINS A LISTING OF TRIPLETS USED AS INPUT TO THE OUTLINE PROGRAM. THE SECTION HEADING FOR A TRIPLET WILL APPEAR WITH THE TRIPLET IN THE OUTLINE GENERATED.

	COMPONENTS		LIMIT STATES		STRESS STATES		
	ELEMENT	SUBELEMENT	ELEMENT	SUBELEMENT	ELEMENT	SUBELEMENT	SECTION HEADING
1.	CONNECTOR	PINS	YIELDING	---	BEARING	---	PROVISION 1
2.	CONNECTOR	ROLLER/ROCKER	YIELDING	---	BEARING	---	PROVISION 2
3.	ELEM. OF MEMB.	BRG STIFFENERS	YIELDING	---	BEARING	---	PROVISION 3
4.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	FLEXURAL FORCE	---	PROVISION 4
5.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	FLEXURAL FORCE	---	PROVISION 5
6.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	FLEXURAL FORCE	---	PROVISION 6
7.	MEMBERS	SOLID SHAPES	YIELDING	---	FLEXURAL FORCE	---	PROVISION 7
8.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	FLEXURAL FORCE	---	PROVISION 8
9.	ELEM. OF MEMB.	BRG STIFFENERS	INSTABILITY	GLOBAL	BEARING	---	PROVISION 9
10.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	AXIAL FORCE	COMPRESSION	PROVISION 10
11.	MEMBERS	SOLID SHAPES	YIELDING	---	AXIAL FORCE	COMPRESSION	PROVISION 11
12.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	PROVISION 12
13.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	AXIAL FORCE	COMPRESSION	PROVISION 13
14.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	PROVISION 14
15.	CONNECTIONS	---	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 15
16.	CONNECTIONS	---	YIELDING	---	AXIAL FORCE	COMPRESSION	PROVISION 16
17.	CONNECTIONS	---	YIELDING	---	FLEXURAL FORCE	---	PROVISION 17
18.	CONNECTIONS	---	YIELDING	---	SHEARING FORCE	---	PROVISION 18
19.	CONNECTIONS	---	YIELDING	---	TORSIONAL FORCE	---	PROVISION 19
20.	CONNECTIONS	---	YIELDING	---	BEARING	---	PROVISION 20
21.	CONNECTIONS	---	YIELDING	---	COMBINED FORCES	SHEAR+BENDING	PROVISION 21
22.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	PROVISION 22
23.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	COMPR+BENDING	PROVISION 23
24.	MEMBERS	SOLID SHAPES	INSTABILITY	GLOBAL	COMBINED FORCES	COMPR+BENDING	PROVISION 24
25.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	COMBINED FORCES	COMPR+BENDING	PROVISION 25
26.	MEMBERS	SOLID SHAPES	YIELDING	---	COMBINED FORCES	COMPR+BENDING	PROVISION 26
27.	MEMBERS	THIN-WALL SHAPE	INSTABILITY	LOCAL	COMBINED FORCES	TENSION+BENDING	PROVISION 27
28.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	COMBINED FORCES	TENSION+BENDING	PROVISION 28
29.	MEMBERS	SOLID SHAPES	YIELDING	---	COMBINED FORCES	TENSION+BENDING	PROVISION 29
30.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	AXIAL FORCE	COMPRESSION	PROVISION 30
31.	ELEM. OF MEMB.	BM/GRDR WEB	INSTABILITY	GLOBAL	AXIAL FORCE	COMPRESSION	PROVISION 31
32.	MEMBERS	ENCASED COMP.	YIELDING	---	FLEXURAL FORCE	---	PROVISION 32
33.	CONNECTOR	BOLTS	YIELDING	---	SHEARING FORCE	---	PROVISION 33
34.	CONNECTOR	BOLTS	YIELDING	---	BEARING	---	PROVISION 34
35.	CONNECTOR	RIVETS	YIELDING	---	SHEARING FORCE	---	PROVISION 35
36.	CONNECTOR	RIVETS	YIELDING	---	BEARING	---	PROVISION 36
37.	CONNECTOR	BEARING SURFACE	YIELDING	---	BEARING	---	PROVISION 37
38.	CONNECTOR	SHEAR CONNECTOR	YIELDING	---	SHEARING FORCE	---	PROVISION 38
39.	MEMBERS	NON-ENC. COMP.	YIELDING	---	FLEXURAL FORCE	---	PROVISION 39
40.	MEMBERS	NON-ENC. COMP.	INSTABILITY	LOCAL	FLEXURAL FORCE	---	PROVISION 40
41.	ELEM. OF MEMB.	BM/GRDR WEB	YIELDING	---	SHEARING FORCE	---	PROVISION 41
42.	CONNECTOR	GROOVE WELD	YIELDING	---	SHEARING FORCE	---	PROVISION 42
43.	CONNECTOR	GROOVE WELD	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 43
44.	CONNECTOR	GROOVE WELD	YIELDING	---	AXIAL FORCE	COMPRESSION	PROVISION 44
45.	CONNECTOR	PLUG/SLOT WELD	YIELDING	---	SHEARING FORCE	---	PROVISION 45
46.	CONNECTOR	FILLET WELD	YIELDING	---	SHEARING FORCE	---	PROVISION 46
47.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	SHEARING FORCE	---	PROVISION 47
48.	MEMBERS	SOLID SHAPES	YIELDING	---	SHEARING FORCE	---	PROVISION 48
49.	CONNECTOR	RIVETS	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 49
50.	CONNECTOR	BOLTS	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 50
51.	MEMBERS	THIN-WALL SHAPE	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 51
52.	MEMBERS	SOLID SHAPES	YIELDING	---	AXIAL FORCE	TENSION	PROVISION 52

Table No., Top Level Outline for Modified Specification (Components, Limit States, Stress States)

SPECIFICATION OUTLINE ARRANGED BY

COMPONENTS
LIMIT STATES
STRESS STATES

Outline	Provision
1. MEMBERS	
1.1 THIN-WALL SHAPE	
1.1.1 YIELDING	
1.1.1.1 AXIAL FORCE	
1.1.1.1.1 TENSION	PROVISION 51
1.1.1.1.2 COMPRESSION	PROVISION 10
1.1.1.2 FLEXURAL FORCE	PROVISION 6
1.1.1.3 SHEARING FORCE	PROVISION 47
1.1.1.4 COMBINED FORCES	
1.1.1.4.1 COMPR+BENDING	PROVISION 25
1.1.1.4.2 TENSION+BENDING	PROVISION 28
1.1.2 INSTABILITY	
1.1.2.1 GLOBAL	
1.1.2.1.1 AXIAL FORCE COMPRESSION	PROVISION 12
1.1.2.1.2 FLEXURAL FORCE	PROVISION 4
1.1.2.1.3 COMBINED FORCES COMPR+BENDING	PROVISION 22
1.1.2.2 LOCAL	
1.1.2.2.1 AXIAL FORCE COMPRESSION	PROVISION 13
1.1.2.2.2 FLEXURAL FORCE	PROVISION 5
1.1.2.2.3 COMBINED FORCES	
1.1.2.2.3.1 COMPR+BENDING	PROVISION 23
1.1.2.2.3.2 TENSION+BENDING	PROVISION 27
1.2 SOLID SHAPES	
1.2.1 YIELDING	
1.2.1.1 AXIAL FORCE	
1.2.1.1.1 TENSION	PROVISION 52
1.2.1.1.2 COMPRESSION	PROVISION 11
1.2.1.2 FLEXURAL FORCE	PROVISION 7
1.2.1.3 SHEARING FORCE	PROVISION 48
1.2.1.4 COMBINED FORCES	
1.2.1.4.1 COMPR+BENDING	PROVISION 26
1.2.1.4.2 TENSION+BENDING	PROVISION 29
1.2.2 INSTABILITY GLOBAL	
1.2.2.1 AXIAL FORCE COMPRESSION	PROVISION 14
1.2.2.2 FLEXURAL FORCE	PROVISION 8
1.2.2.3 COMBINED FORCES COMPR+BENDING	PROVISION 24
1.3 ENCASED COMP. YIELDING FLEXURAL FORCE	PROVISION 32
1.4 NON-ENC. COMP.	
1.4.1 YIELDING FLEXURAL FORCE	PROVISION 39
1.4.2 INSTABILITY LOCAL FLEXURAL FORCE	PROVISION 40
2. ELEM. OF MEMB.	
2.1 BRG STIFFENERS	
2.1.1 YIELDING BEARING	PROVISION 3

Table 4.6, Continued

2.1.2 INSTABILITY GLOBAL BEARING	PROVISION 9
2.2 BM/GRDR WEB	
2.2.1 YIELDING	
2.2.1.1 AXIAL FORCE COMPRESSION	PROVISION 30
2.2.1.2 SHEARING FORCE	PROVISION 41
2.2.2 INSTABILITY GLOBAL AXIAL FORCE COMPRESSION	PROVISION 31
3. CONNECTIONS YIELDING	
3.1 AXIAL FORCE	
3.1.1 TENSION	PROVISION 15
3.1.2 COMPRESSION	PROVISION 16
3.2 FLEXURAL FORCE	PROVISION 17
3.3 SHEARING FORCE	PROVISION 18
3.4 TORSIONAL FORCE	PROVISION 19
3.5 BEARING	PROVISION 20
3.6 COMBINED FORCES SHEAR+BENDING	PROVISION 21
4. CONNECTOR	
4.1 BOLTS YIELDING	
4.1.1 AXIAL FORCE TENSION	PROVISION 50
4.1.2 SHEARING FORCE	PROVISION 33
4.1.3 BEARING	PROVISION 34
4.2 RIVETS YIELDING	
4.2.1 AXIAL FORCE TENSION	PROVISION 49
4.2.2 SHEARING FORCE	PROVISION 35
4.2.3 BEARING	PROVISION 36
4.3 GROOVE WELD YIELDING	
4.3.1 AXIAL FORCE	
4.3.1.1 TENSION	PROVISION 43
4.3.1.2 COMPRESSION	PROVISION 44
4.3.2 SHEARING FORCE	PROVISION 42
4.4 PLUG/SLOT WELD YIELDING SHEARING FORCE	PROVISION 45
4.5 FILLET WELD YIELDING SHEARING FORCE	PROVISION 46
4.6 SHEAR CONNECTOR YIELDING SHEARING FORCE	PROVISION 38
4.7 BEARING SURFACE YIELDING BEARING	PROVISION 37
4.8 PINS YIELDING BEARING	PROVISION 1
4.9 ROLLER/ROCKER YIELDING BEARING	PROVISION 2

SPECIFICATION OUTLINE ARRANGED BY

COMPONENTS
STRESS STATES
LIMIT STATES

1. MEMBERS	
1.1 THIN-WALL SHAPE	
1.1.1 AXIAL FORCE	
1.1.1.1 TENSION	
YIELDING	PROVISION 51
1.1.1.2 COMPRESSION	
1.1.1.2.1 YIELDING	PROVISION 10
1.1.1.2.2 INSTABILITY	
1.1.1.2.2.1 GLOBAL	PROVISION 12
1.1.1.2.2.2 LOCAL	PROVISION 13
1.1.2 FLEXURAL FORCE	
1.1.2.1 YIELDING	PROVISION 6
1.1.2.2 INSTABILITY	
1.1.2.2.1 GLOBAL	PROVISION 4
1.1.2.2.2 LOCAL	PROVISION 5
1.1.3 SHEARING FORCE	
YIELDING	PROVISION 47
1.1.4 COMBINED FORCES	
1.1.4.1 COMPR+BENDING	
1.1.4.1.1 YIELDING	PROVISION 25
1.1.4.1.2 INSTABILITY	
1.1.4.1.2.1 GLOBAL	PROVISION 22
1.1.4.1.2.2 LOCAL	PROVISION 23
1.1.4.2 TENSION+BENDING	
1.1.4.2.1 YIELDING	PROVISION 28
1.1.4.2.2 INSTABILITY	
LOCAL	PROVISION 27
1.2 SOLID SHAPES	
1.2.1 AXIAL FORCE	
1.2.1.1 TENSION	
YIELDING	PROVISION 52
1.2.1.2 COMPRESSION	
1.2.1.2.1 YIELDING	PROVISION 11
1.2.1.2.2 INSTABILITY	
GLOBAL	PROVISION 14
1.2.2 FLEXURAL FORCE	
1.2.2.1 YIELDING	PROVISION 7
1.2.2.2 INSTABILITY	
GLOBAL	PROVISION 8
1.2.3 SHEARING FORCE	
YIELDING	PROVISION 48
1.2.4 COMBINED FORCES	
1.2.4.1 COMPR+BENDING	
1.2.4.1.1 YIELDING	PROVISION 26
1.2.4.1.2 INSTABILITY	
GLOBAL	PROVISION 24
1.2.4.2 TENSION+BENDING	
YIELDING	PROVISION 29
1.3 ENCASED COMP.	
FLEXURAL FORCE	
YIELDING	PROVISION 32
1.4 NON-ENC. COMP.	
FLEXURAL FORCE	
1.4.1 YIELDING	PROVISION 39
1.4.2 INSTABILITY	

Table 4.7, Continued

LOCAL	PROVISION 40
2. ELEM. OF MEMB.	
2.1 BRG STIFFENERS	
BEARING	
2.1.1 YIELDING	PROVISION 3
2.1.2 INSTABILITY	
GLOBAL	PROVISION 9
2.2 BM/GRDR WEB	
2.2.1 AXIAL FORCE	
COMPRESSION	
2.2.1.1 YIELDING	PROVISION 30
2.2.1.2 INSTABILITY	
GLOBAL	PROVISION 31
2.2.2 SHEARING FORCE	
YIELDING	PROVISION 41
3. CONNECTIONS	
3.1 AXIAL FORCE	
3.1.1 TENSION	
YIELDING	PROVISION 15
3.1.2 COMPRESSION	
YIELDING	PROVISION 16
3.2 FLEXURAL FORCE	
YIELDING	PROVISION 17
3.3 SHEARING FORCE	
YIELDING	PROVISION 18
3.4 TORSIONAL FORCE	
YIELDING	PROVISION 19
3.5 BEARING	
YIELDING	PROVISION 20
3.6 COMBINED FORCES	
SHEAR+BENDING	
YIELDING	PROVISION 21
4. CONNECTOR	
4.1 BOLTS	
4.1.1 AXIAL FORCE	
TENSION	
YIELDING	PROVISION 50
4.1.2 SHEARING FORCE	
YIELDING	PROVISION 33
4.1.3 BEARING	
YIELDING	PROVISION 34
4.2 RIVETS	
4.2.1 AXIAL FORCE	
TENSION	
YIELDING	PROVISION 49
4.2.2 SHEARING FORCE	
YIELDING	PROVISION 35
4.2.3 BEARING	
YIELDING	PROVISION 36
4.3 GROOVE WELD	
4.3.1 AXIAL FORCE	
4.3.1.1 TENSION	
YIELDING	PROVISION 43
4.3.1.2 COMPRESSION	
YIELDING	PROVISION 44
4.3.2 SHEARING FORCE	
YIELDING	PROVISION 42
4.4 PLUG/SLOT WELD	
SHEARING FORCE	
YIELDING	PROVISION 45
4.5 FILLET WELD	
SHEARING FORCE	

Table 4.7, Continued

	YIELDING	PROVISION 46
4.6	SHEAR CONNECTOR	
	SHEARING FORCE	
	YIELDING	PROVISION 38
4.7	BEARING SURFACE	
	BEARING	
	YIELDING	PROVISION 37
4.8	PINS	
	BEARING	
	YIELDING	PROVISION 1
4.9	ROLLER/ROCKER	
	BEARING	
	YIELDING	PROVISION 2

Table 4.8, Intermediate Level Organization of TCOMPR, "Compression Member Check" (Direct Execution)

DIRECT EXECUTION OUTLINE FOR THE FOLLOWING TERMINAL CRITERIA
TCOMPR

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7	8
								ABCPN
								ABST
								BAPDXC
								FSTRS
								FY
								VFLNGF
							AREFF	ZTST
						XEASTE	*ZTST	
							*ABST	
					XQA	XBCASE	*ZTST	
							DPR	
							VSECTN	
							WFL	
							ZTFL	
						BUCOK	ZTWFR	
						ABUN		
						*BAPDXC		
						*FY		
						VANGLE		
					QS	ZIUN		
					E			
				XCC	*FY			
				**XQA				
				**QS				
					AR			
					BKP			
					BSSP			
					EL			
					UK			
				UKP	VMTYPF			
				*AR				
				*E				
			FFA	*EL				
			*AR					
			*EL					
		FFAP	*VMTYPE					
				BANGLF				
				W				
				W1				
				W2				
			AGRS	ZY				
	XRA	XFA	FORCE					
			**BUCOK					
			*ABUN					
			*BAPDXC					
			*FY					
			*VANGLF					
		BUNOK	*ZTUN					
			*ABST					
			*BAPDXC					
			*FY					
			*VFLNGF					
		BSTOK	*ZTST					
		BSTIF						
	B19OK	BUNST						
	**UKP							
	*AR							
TCOMPR	*EL							

Table 4.9, Computational Steps for Direct Execution of "Compression Member Check"
(Corresponds to Table 4.8)

Step	LEVELS 1	2	3	4	5	6	7	8	Section in Present Specification
1	Compute effective width, b_e								Appendix C
2		Compute effective area of stiffened element							indirectly from 1.9.2.2
3		Compute actual area of stiffened element							indirectly from 1.9.2.2
4			Compute Q_a						Appendix C
5		Check geometrical constraints (Table C1)							Appendix C
6			Compute Q_s						Appendix C
7				Compute C_c (Appendix C definition)					Appendix C
8				Compute K factor for effective length					1.8.2
9					Compute allowable stress, F_a (Eq. C5-1 or 1.5-2)				1.5.1.3 or Appendix C
10						Compute modified allowable stress, F_{as} (Eq. 1.5-3)			1.5.1.3
11					Compute gross area, A_g				indirectly from 1.14.1
12						Compute actual stress, f_a			indirectly from 1.5.1.3
13							Compute $R_a = f_a/F_a$		1.5.1.3
14						Check unstiffened elements			1.9.1.2
15						Check stiffened elements			1.9.2.2
16							Check Section 1.9		1.9
17								Check compression member	1.5.1.3

Table 4.10, Intermediate Level Organization of TCOMPR, "Compression Member Check"
(Conditional Execution)

CONDITIONAL EXECUTION OUTLINE FOR THE FOLLOWING TERMINAL CRITERIA
TCOMPR

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7
TCOMPR	EL						
	AR						
	UKP	VMTYPE					
		UK					
		*EL					
		BSSP					
		BKP					
		*AR					
	B190K	BUNST					
		BSTIF					
		BSTOK	ZTST				
			VFLNGE				
			FY				
			BAPDXC				
			ARST				
		BUNOK	ZTUN				
			VANGLE				
			*FY				
			*BAPDXC				
			ABUN				
			BGCOK	ZTWEB			
				ZTFL			
				WFL			
				VSECTN			
				DPR			
	XRA	XFA	FORCE				
			AGRS	ZT			
				W2			
				W1			
				W			
				BANGLE			
		FFAP	*VMTYPE				
			*EL				
			*AR				
			FFA	*EL			
				E			
				*AR			
				**UKP			
				QS	*ZTUN		
					*VANGLE		
					*FY		
					*BAPDXC		
					*ABUN		
					**BGCOK		
				XQA	XACASE	*ZTST	
						*ARST	
					XEASTE	*ZTST	
						ABFFF	*ZTST
							*VFLNGE
							*FY
							FSTRS
							*BAPDXC
							*ARST
							ARCPN
				XCC	*FY		
					*E		
					**QS		
					**XQA		

Table 4.11, Computational Steps for Conditional Execution of "Compression Member Check"
(Corresponds to Table 4.10)

Step	LEVELS 1	2	3	4	5	6	7	Section in Present Specification
1	Check Compression member							1.5.1.3
2		Compute K factor for effective length						1.8.2
3		Check Section 1.9						1.9
4			Check stiffened elements					1.9.2.2
5			Check unstiffened elements					1.9.1.2
6				Check geometrical constraints (Table C1)				Appendix C
7		Compute $R_a = f_a/F_a$						1.5.1.3
8			Compute actual stress, f_a					indirectly from 1.5.1.3
9				Compute gross area, A_g				indirectly from 1.14.1
10			Compute modified allowable stress, F_{as} (Eq. 1.5-3)					1.5.1.3
11				Compute allowable stress, F_a (Eq. C5-1 or 1.5-2)				1.5.1.3 or Appendix C
12					Compute Q_s			Appendix C
13					Compute Q_a			Appendix C
14						Compute actual area of stiffened element		indirectly from 1.9.2.2
15						Compute effective area of stiffened element		indirectly from 1.9.2.2
16							Compute effective width, b_e	Appendix C
17					Compute C_c (Appendix C definition)			Appendix C

Table 4.12, Computational Steps for "Compression Member Check" Listed in Order of Present AISC Specification

Step in Present AISC Specification	Description of Computational Step	Section in Present Specification	Step for Direct Execution	Step for Conditional Execution
1	Compute actual stress, f_a	indirectly from 1.5.1.3	12	8
2	Compute allowable stress, F_a (Eq. 1.5-2 or C5-1)	1.5.1.3 or Appendix C	9	11
3	Compute modified allowable stress, F_{as} (Eq. 1.5.3)	1.5.1.3	10	10
4	Compute $R_a = f_a/F_a$	1.5.1.3	13	7
5	Check compression member	1.5.1.3	17	1
6	Compute K factor for effective length	1.8.2	8	2
7	Check unstiffened elements	1.9.1.2	15	5
8	Check stiffened elements	1.9.2.2	14	4
9	Compute actual area of stiffened element	indirectly from 1.9.2.2	3	14
10	Compute effective area of stiffened element	indirectly from 1.9.2.2	2	15
11	Check Section 1.9	1.9	16	3
12	Compute gross area, A_g	indirectly from 1.14.1	11	9
13	Compute Q_s	Appendix C	6	12
14	Check geometrical constraints (Table C1)	Appendix C	5	6
15	Compute effective width, b_e	Appendix C	1	16
16	Compute Q_a	Appendix C	4	13
17	Compute C_c (Appendix C definition)	Appendix C	7	17

Table 4.13, Intermediate Level Organization of Part 2 of Top Level Outline in Tables 4.3 and 4.4 (Direct Execution)

DIRECT EXECUTION OUTLINE FOR THE FOLLOWING TERMINAL CRITERIA
TBEAR TCOMBS TSBMGR TSA51A TSBGST TCWTOE

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7
							BANGLE
							BCDLEG
							G
							G1
							G2
						GS	ZT
					XREDUC	ZSK	
						*BANGLE	
						W	
						W1	
						W2	
					AGRS	*ZI	
					DIA		
					NU		
				XANET	*ZT		
				**AGRS			
				BMID			
				GROSI			
			ZTIAN	REDI			
			FLXM				
		XFBT	Y2				
			XFFV	FY			
				AGRSP			
		XRV	XFV	FORCE			
	BCSADK	*FY					
					A		
				ZSMALK	H		
				*FY			
				*H			
			XCV1	ZTW			
				**ZSMALK			
				*FY			
				*H			
		CV	XCV2	*ZTW			
		*A					
		AGST					
		BTFD					
		DD					
		*H					
		Y					
		ZSTIW					
	BISSDK	*ZTW					
	**CV						
	*A						
	AW						
	BENDP						
	BPWLH						
	*BTFD						
	FVWEB						
	*FY						

Table 4.13, Continued

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7
	*H						
TSBGST	*ZTW						
				DPR			
				VSECTN			
				WFL			
				ZTFL			
			BGCOK	ZTWEB			
			ABUN				
			BAPDXC				
			*FY				
			VANGLE				
		BUNOK	ZTUN				
			ABST				
			*BAPDXC				
			*FY				
			VFLNGE				
		BSTOK	ZTST				
		BSTIF					
	B19OK	BUNST					
				ABSTF			
				BENDST			
			APR1	*ZTW			
		XFA1	FBRSTF				
TCOMBS	XRA1	XFFA1	*FY				
	**CV						
	*AW						
	*FVWEB						
TSA514	*FY						
			DPIN				
			FY1				
			FY2				
		FFP	VEXPND				
			ABRNG				
			ELRR				
			*FORCE				
TREAR	XRP	FP	*VEXPND				
			AKAY				
			ENB				
			FLOAD				
			VLOAD				
		FA2	*ZTW				
	XRA2	XFFA2	*FY				
TCWTOE	BBSTP						
		*FY					
		*H					
	CKV	*ZTW					
	*FVWEB						
	*FY						
	*H						
	*W						
TSBMGR	*ZTW						

Table 4.14, Computational Steps for Direct Execution of Criteria in Table 4.13

Step	LEVELS 1	2	3	4	5	6	7	Section in Present Specification
1	Calculate gage space for staggered holes, g_k							1.14.3
2		Compute reduction for staggered holes						1.14.3
3		Compute gross area, A_g						indirectly from 1.14.1
4			Compute net area, A_n					1.14
5				Compute moment of inertia, I				indirectly from 1.14
6					Compute actual tension stress due to bending, f_{bt}			indirectly from 1.10.6
7				Compute allowable shear stress, F_v				1.10.6
8				Compute actual shear stress, f_v				indirectly from 1.5.1.2
9					Compute shear stress ratio, R_v			1.5.1.2
10						Check combined stress action in plate		1.10.7
11			Compute k (as used in Sect. 1.10.5.2)					1.10.5.2
12				Compute C_v by first formula				1.10.5.2
13				Compute C_v by second formula				1.10.5.2
14					Compute C_v, i.e., select appropriate formula			1.10.5.2
15						Check intermediate stiffener size		1.10.5.4
16							Check shear on beam/girder with stiffeners	1.10.5.2
17				Check geometrical constraints (Table C1)				Appendix C
18					Check unstiffened elements			1.9.1.2

Table 4.14, Continued

Step	LEVELS 1	2	3	4	5	6	7	Section in Present Specification
19					Check stiffened elements			1.9.2.2
20						Check Section 1.9		1.9
21				Compute modified area of bearing stiffener				1.10.5.1
22					Compute actual stress in bearing stiffener, f_a			indirectly from 1.10.5.1
23					Compute allowable stress in bearing stiffener, F_a			1.5.1.3.4
24						Compute stress ratio for bearing stiffener, R_a		1.10.5.1
25							Check compression on bearing stiffeners	1.10.5.1
26							Check shear on hybrid A514 steel girder	1.10.5.2
27					Compute allowable bearing stress, F_p			1.5.1.5
28					Compute actual bearing stress, f_p			indirectly from 1.5.1.5
29						Compute bearing stress ratio, R_p		1.5.1.5
30							Check bearing	1.5.1.5
31					Compute actual stress at web toe of fillet, f_a			1.10.10
32					Compute allowable stress at web toe of fillet, F_a			1.10.10
33						Compute stress ratio for web toe of fillet, R_a		1.10.10
34							Check compression in web toe of fillet	1.10.10
35						Compute C_v for no stiffeners and $k > 5.34$		1.10.5.2
36							Check shear on beam/girders	1.10.5.2

Table 4.15, Intermediate Level Organization of Part 2 of Top Level Outline in Tables 4.3 and 4.4 (Conditional Execution)

CONDITIONAL EXECUTION OUTLINE FOR THE FOLLOWING TERMINAL CRITERIA
TBEAR TCOMBS TSBMGR TSA514 TSBGST TCWTOE

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7
TSBMGR	ZTW						
	W						
	H						
	FY						
	FVWEB						
	CKV	*ZTW					
		*H					
		*FY					
TCWTOE	BBSTP						
	XRA2	XFFA2	*FY				
		FA2	*ZTW				
			VLOAD				
			FLOAD				
			ENB				
			AKAY				
TBEAR	XRP	FP	VEXPND				
			FORCE				
			FLRR				
			ABRNG				
		FFP	*VEXPND				
			FY2				
			FY1				
			DPIN				
TSA514	*FY						
	*FVWEB						
	AW						
	CV	XCV2	*ZTW				
			*H				
			*FY				
			ZSMALK	*H			
				A			
		XCV1	*ZTW				
			*H				
			*FY				
			**ZSMALK				
TCOMBS	XRA1	XFFA1	*FY				
		XFA1	FBRSTF				
			APR1	*ZTW			
				BENDST			
				ABSTF			
	B19DK	BUNST					
		BSTIF					
		BSTDK	ZTST				
			VFLNGE				
			*FY				
			BAPDXC				
			ABST				
		BUNDK	ZTUN				
			VANGLE				
			*FY				

Table 4.15, Continued

RELATIVE LEVELS FROM TERMINAL CRITERIA

0	1	2	3	4	5	6	7
			*BAPDXC				
			ABUN				
			BGCOK	ZTWEB			
				ZTFL			
				WFL			
				VSECTN			
				DPR			
TSBGST	*ZTW						
	*H						
	*FY						
	*FVWEB						
	BTFD						
	BPWLH						
	BENDP						
	*AW						
	*A						
	**CV						
	BISSOK	*ZTW					
		ZSTIW					
		Y					
		*H					
		DD					
		*BTFD					
		AGST					
		*A					
		**CV					
	BCSAOK	*FY					
		XRV	XFV	*FORCE			
				AGRSP			
			XFFV	*FY			
		XFBT	Y2				
			FLXM				
			ZTIAN	REDI			
				GROSI			
				BMID			
				AGRS	ZT		
					W2		
					W1		
					*W		
					BANGLE		
				XANET	*ZT		
					NU		
					DIA		
					**AGRS		
					XREDUC	ZSK	
						GS	*ZT
							G2
							G1
							G
							BCOLEG
							*BANGLE

Table 4.16, Computational Steps for Conditional Execution of Criteria in Table 4.15.

Step	LEVELS 1	2	3	4	5	6	7	Section in Present Specification
1	Check shear on beams/girders							1.10.5.2
2		Compute c_v for no stiffeners and $k > 5.34$						1.10.5.2
3	Check compression in web toe of fillet							1.10.10
4		Compute stress ratio for web toe of fillet, R_a						1.10.10
5			Compute allowable stress at web toe of fillet, F_a					1.10.10
6			Compute actual stress at web toe of fillet, f_a					1.10.10
7	Check bearing							1.5.1.5
8		Compute bearing stress ratio, R_p						1.5.1.5
9			Compute actual bearing stress, f_p					1.5.1.5
10			Compute allowable bearing stress, F_p					1.5.1.5
11	Check shear on hybrid A514 steel girder							1.10.5.2
12		Compute C_v, i.e., select appropriate formula						1.10.5.2
13			Compute C_v by 2nd formula					1.10.5.2
14				Compute k (as used in Sect. 1.10.5.2)				1.10.5.2
15			Compute C_v by 1st formula					1.10.5.2
16	Check compression on bearing stiffener							1.10.5.1
17		Compute stress ratio for bearing stiffener, R_a						1.10.5.1
18			Compute allowable stress in bearing stiffener, F_a					1.5.1.3.4
19			Compute actual stress in bearing stiffener, f_a					indirectly from 1.10.5.1
20				Compute modified area of bearing stiffener				1.10.5.1
21		Check Section 1.9						1.9
22			Check stiffened elements					1.9.2.2
23			Check unstiffened elements					1.9.1.2
24				Check geometrical constraints (Table C1)				Appendix C

Table 4.16, Continued

Step	LEVELS 1 2 3 4 5 6 7		Section in Present Specification
25	Check shear on beam/girders with stiffeners		1.10.5.2
26	Check intermediate stiffener size		1.10.5.4
27	Check combined stress action in plate (web)		1.10.7
28	Compute shear stress ratio, R_v		1.5.1.2
29	Compute actual shear stress, f_v	indirectly from	1.5.1.2
30	Compute allowable shear stress, F_v		1.5.1.2
31	Compute actual tension stress due to bending, f_{bt}	indirectly from	1.10.6
32	Compute moment of inertia, I	indirectly from	1.14
33	Compute gross area, A_g	indirectly from	1.14.1
34	Compute net area, A_n	indirectly from	1.14
35	Compute reduction for staggered holes		1.14.3
36	Calculate gage space for staggered holes, g_k		1.14.3

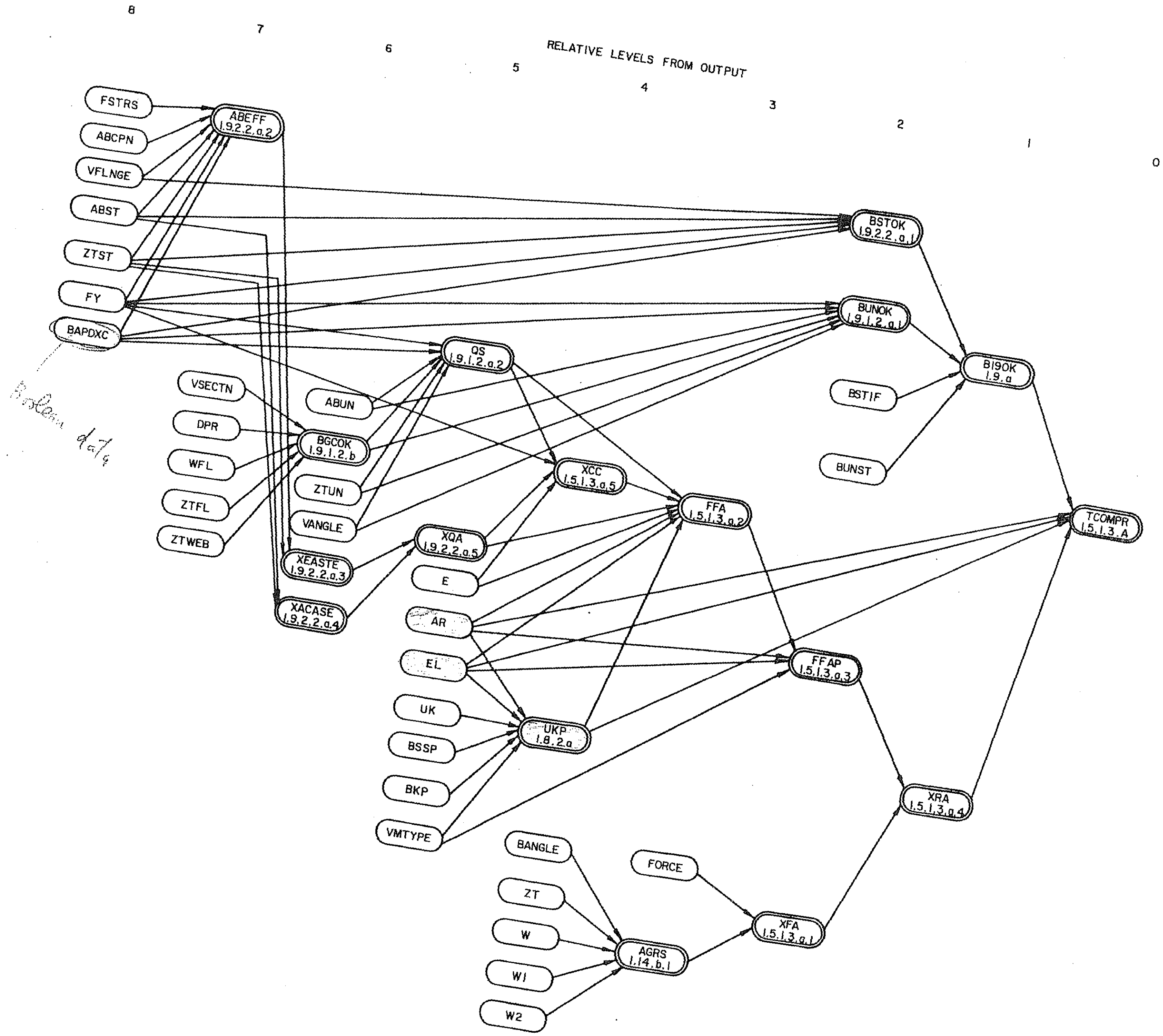

Fig. 2.1, Global Ingredience Network of Criterion "Compression Member Check"

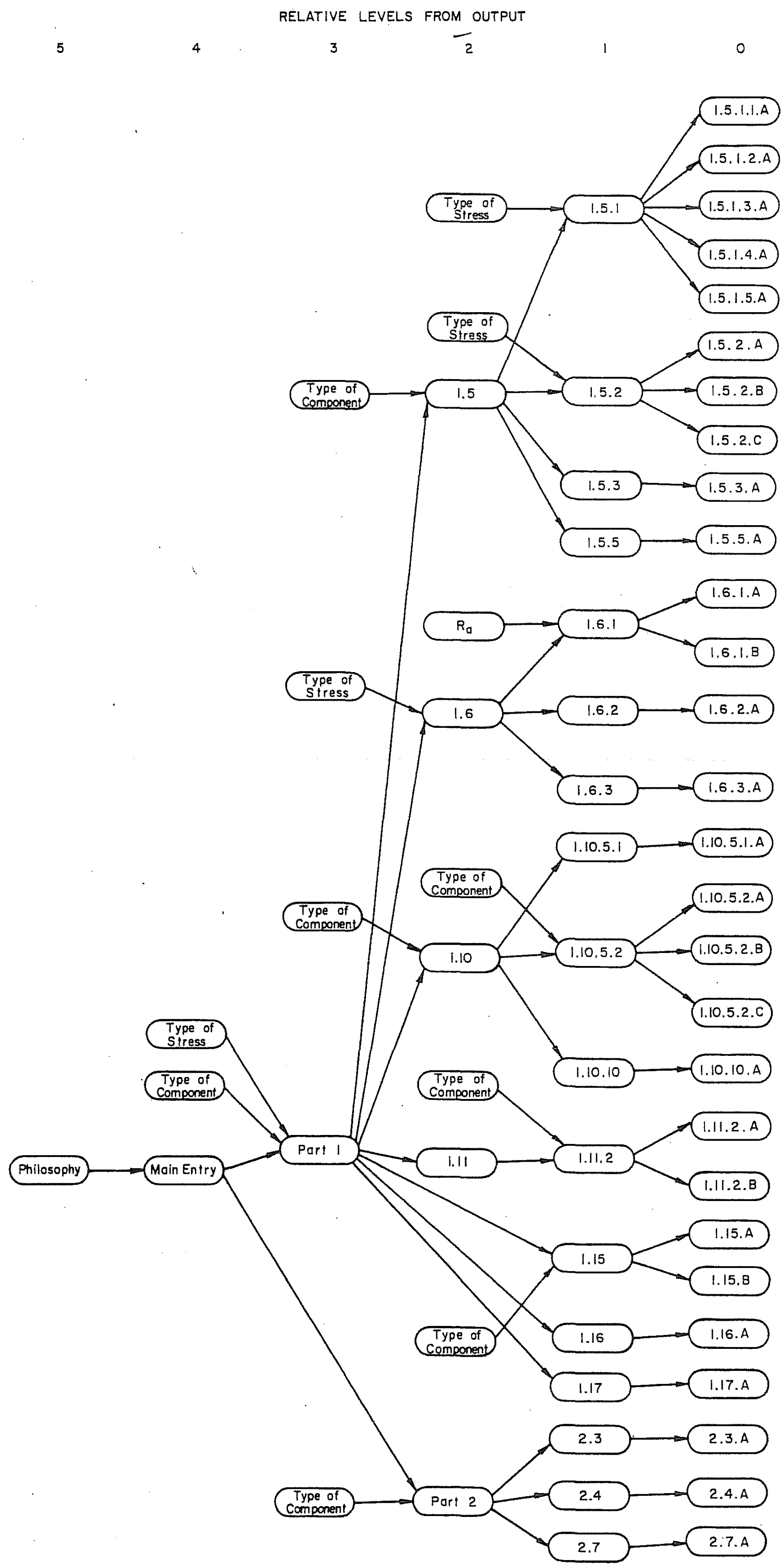

Fig. 2.2, Network Corresponding to Present AISC Specifications(1969)

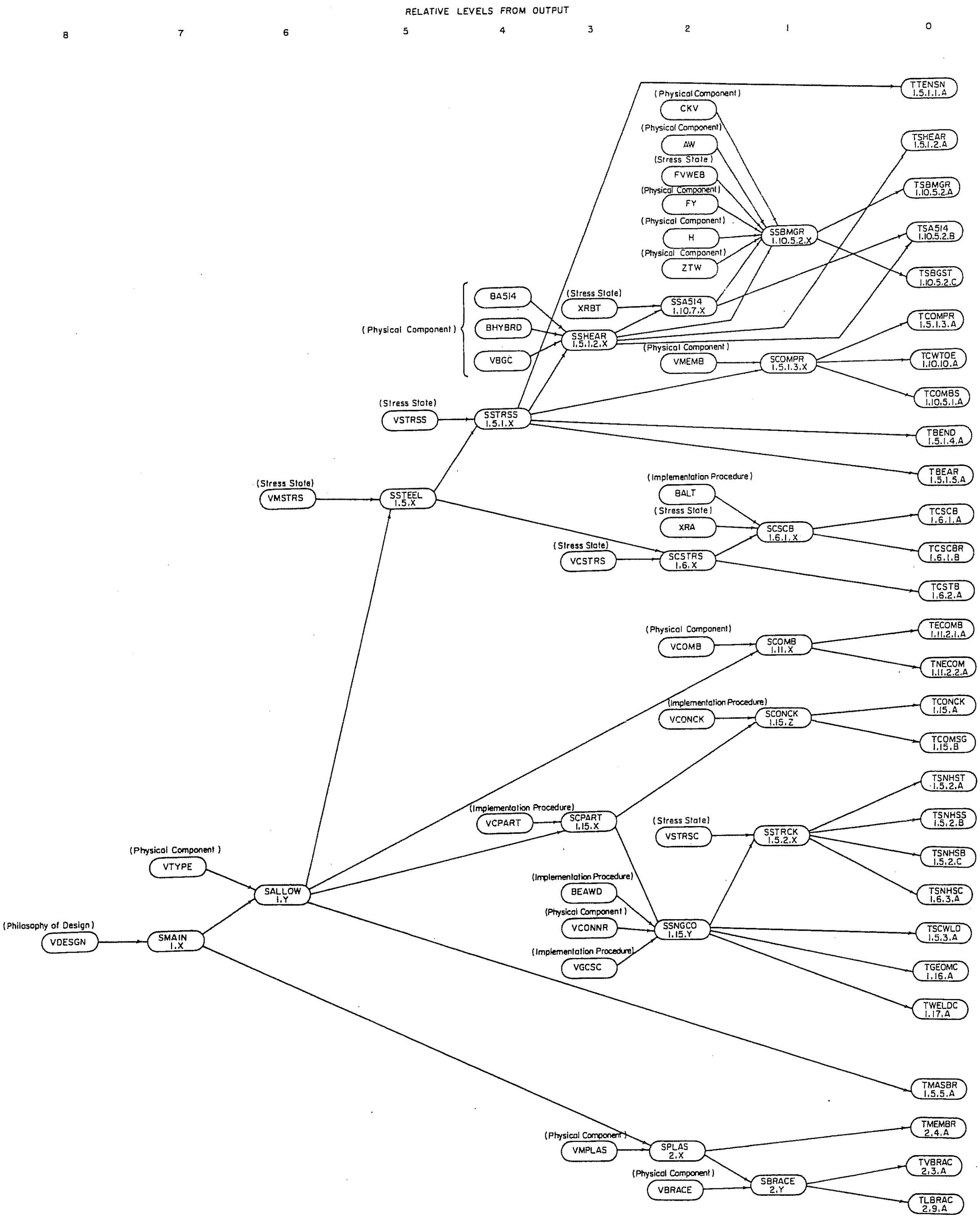

Fig. 3.1, Alternate Switching Network for Present Organization

APPENDIX A

ADDITIONAL EXAMPLES OF TOP LEVEL ORGANIZATION

In Section 4.1.1, two possible top level outlines of the present Specification were presented and discussed. These two outlines, with components as the topmost base in the organization hierarchy, seem to be the most reasonable and practical organization. For the sake of comparison, the other four possible orders of the bases were used to generate the four topical outlines in this appendix. The four orders are as follows:

1) Stress State, Limit State, Component
2) Stress State, Component, Limit State
3) Limit State, Stress State, Component
4) Limit State, Component, Stress State

Interpretations of the outlines and conclusions are left to the reader.

SPECIFICATION OUTLINE ARRANGED BY

STRESS STATES
LIMIT STATES
COMPONENTS

1. AXIAL FORCE				
1.1 TENSION				
YIELDING				
1.1.1 MEMBERS				
1.1.1.1 THIN-WALL SHAPE	1.5.1.1.A			
1.1.1.2 SOLID SHAPES	1.5.1.1.A			
1.1.2 CONNECTIONS	1.15.A			
1.1.3 CONNECTOR				
1.1.3.1 BOLTS	1.6.3.A	1.5.2.A		
1.1.3.2 RIVETS	1.6.3.A	1.5.2.A		
1.1.3.3 GROOVE WELD	1.5.3.A			
1.2 COMPRESSION				
1.2.1 YIELDING				
1.2.1.1 MEMBERS				
1.2.1.1.1 THIN-WALL SHAPE	1.5.1.3.A	2.3.A		
1.2.1.1.2 SOLID SHAPES	1.5.1.3.A	2.3.A		
1.2.1.2 ELEM. OF MEMB.				
BM/GRDR WEB	1.10.10.A			
1.2.1.3 CONNECTIONS	1.15.A			
1.2.1.4 CONNECTOR				
GROOVE WELD	1.5.3.A			
1.2.2 INSTABILITY				
1.2.2.1 GLOBAL				
1.2.2.1.1 MEMBERS				
1.2.2.1.1.1 THIN-WALL SHAPE	1.5.1.3.A	2.4.A	2.3.A	
1.2.2.1.1.2 SOLID SHAPES	1.5.1.3.A	2.4.A	2.3.A	
1.2.2.1.2 ELEM. OF MEMB.				
BM/GRDR WEB	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
1.2.2.2 LOCAL				
MEMBERS				
THIN-WALL SHAPE	1.5.1.3.A	2.4.A		
2. FLEXURAL FORCE				
2.1 YIELDING				
2.1.1 MEMBERS				
2.1.1.1 THIN-WALL SHAPE	1.5.1.4.A			
2.1.1.2 SOLID SHAPES	1.5.1.4.A			
2.1.1.3 ENCASED COMP.	1.11.2.1.A			
2.1.1.4 NON-ENC. COMP.	1.11.2.2.A			
2.1.2 CONNECTIONS	1.15.A			
2.2 INSTABILITY				
2.2.1 GLOBAL				
MEMBERS				
2.2.1.1 THIN-WALL SHAPE	1.5.1.4.A	2.9.A		
2.2.1.2 SOLID SHAPES	1.5.1.4.A	2.9.A		
2.2.2 LOCAL				
MEMBERS				
2.2.2.1 THIN-WALL SHAPE	1.5.1.4.A			
2.2.2.2 NON-ENC. COMP.	1.11.2.2.A			
3. SHEARING FORCE				
YIELDING				
3.1 MEMBERS				
3.1.1 THIN-WALL SHAPE	1.5.1.2.A			
3.1.2 SOLID SHAPES	1.5.1.2.A			
3.2 ELEM. OF MEMB.				
BM/GRDR WEB	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A	

3,3 CONNECTIONS	1,15,A		
3,4 CONNECTOR			
3,4,1 BOLTS	1,16,A	1,6,3,A	1,5,2,B
3,4,2 RIVETS	1,16,A	1,6,3,A	1,5,2,B
3,4,3 GROOVE WELD	1,5,3,A		
3,4,4 PLUG/SLOT WELD	1,5,3,A		
3,4,5 FILLET WELD	1,5,3,A	1,17,A	
3,4,6 SHEAR CONNECTOR	1,11,2,2,A		
4, TORSIONAL FORCE			
YIELDING			
CONNECTIONS	1,15,A		
5, BEARING			
5,1 YIELDING			
5,1,1 ELEM, OF MEMB,			
BRG STIFFENERS	1,5,1,5,A	1,10,5,1,A	
5,1,2 CONNECTIONS	1,15,A		
5,1,3 CONNECTOR			
5,1,3,1 BOLTS	1,16,A	1,5,2,C	
5,1,3,2 RIVETS	1,16,A	1,5,2,C	
5,1,3,3 BEARING SURFACE	1,5,5,A		
5,1,3,4 PINS	1,5,1,5,A		
5,1,3,5 ROLLER/ROCKER	1,5,1,5,A		
5,2 INSTABILITY			
GLOBAL			
ELEM, OF MEMB,			
BRG STIFFENERS	1,10,5,1,A		
6, COMBINED FORCES			
6,1 COMPR+BENDING			
6,1,1 YIELDING			
MEMBERS			
6,1,1,1 THIN-WALL SHAPE	1,6,1,A	1,6,1,B	
6,1,1,2 SOLID SHAPES	1,6,1,A	1,6,1,B	
6,1,2 INSTABILITY			
6,1,2,1 GLOBAL			
MEMBERS			
6,1,2,1,1 THIN-WALL SHAPE	1,6,1,A	1,6,1,B	2,4,A
6,1,2,1,2 SOLID SHAPES	1,6,1,A	1,6,1,B	2,4,A
6,1,2,2 LOCAL			
MEMBERS			
THIN-WALL SHAPE	1,6,1,A	1,6,1,B	2,4,A
6,2 TENSION+BENDING			
6,2,1 YIELDING			
MEMBERS			
6,2,1,1 THIN-WALL SHAPE	1,6,2,A		
6,2,1,2 SOLID SHAPES	1,6,2,A		
6,2,2 INSTABILITY			
LOCAL			
MEMBERS			
THIN-WALL SHAPE	1,6,2,A		
6,3 SHEAR+BENDING			
YIELDING			
CONNECTIONS	1,15,A		

SPECIFICATION OUTLINE ARRANGED BY

STRESS STATES
COMPONENTS
LIMIT STATES

1. AXIAL FORCE				
1.1 TENSION				
1.1.1 MEMBERS				
1.1.1.1 THIN-WALL SHAPE				
YIELDING	1.5.1.1.A			
1.1.1.2 SOLID SHAPES				
YIELDING	1.5.1.1.A			
1.1.2 CONNECTIONS				
YIELDING	1.15.A			
1.1.3 CONNECTOR				
1.1.3.1 BOLTS				
YIELDING	1.6.3.A	1.5.2.A		
1.1.3.2 RIVETS				
YIELDING	1.6.3.A	1.5.2.A		
1.1.3.3 GROOVE WELD				
YIELDING	1.5.3.A			
1.2 COMPRESSION				
1.2.1 MEMBERS				
1.2.1.1 THIN-WALL SHAPE				
1.2.1.1.1 YIELDING	1.5.1.3.A	2.3.A		
1.2.1.1.2 INSTABILITY				
1.2.1.1.2.1 GLOBAL	1.5.1.3.A	2.4.A	2.3.A	
1.2.1.1.2.2 LOCAL	1.5.1.3.A	2.4.A		
1.2.1.2 SOLID SHAPES				
1.2.1.2.1 YIELDING	1.5.1.3.A	2.3.A		
1.2.1.2.2 INSTABILITY				
GLOBAL	1.5.1.3.A	2.4.A	2.3.A	
1.2.2 ELEM. OF MEMB. BM/GRDR WEB				
1.2.2.1 YIELDING	1.10.10.A			
1.2.2.2 INSTABILITY				
GLOBAL	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
1.2.3 CONNECTIONS				
YIELDING	1.15.A			
1.2.4 CONNECTOR				
GROOVE WELD				
YIELDING	1.5.3.A			
2. FLEXURAL FORCE				
2.1 MEMBERS				
2.1.1 THIN-WALL SHAPE				
2.1.1.1 YIELDING	1.5.1.4.A			
2.1.1.2 INSTABILITY				
2.1.1.2.1 GLOBAL	1.5.1.4.A	2.9.A		
2.1.1.2.2 LOCAL	1.5.1.4.A			
2.1.2 SOLID SHAPES				
2.1.2.1 YIELDING	1.5.1.4.A			
2.1.2.2 INSTABILITY				
GLOBAL	1.5.1.4.A	2.9.A		
2.1.3 ENCASED COMP.				
YIELDING	1.11.2.1.A			
2.1.4 NON-ENC. COMP.				
2.1.4.1 YIELDING	1.11.2.2.A			
2.1.4.2 INSTABILITY				
LOCAL	1.11.2.2.A			
2.2 CONNECTIONS				

YIELDING	1,15,A		
3. SHEARING FORCE			
3,1 MEMBERS			
3.1.1 THIN-WALL SHAPE			
YIELDING	1,5.1.2.A		
3.1.2 SOLID SHAPES			
YIELDING	1,5.1.2.A		
3,2 ELEM. OF MEMB.			
BM/GRDR WEB			
YIELDING	1,10.5.2.B	1.10.5.2.C	1.10.5.2.A
3,3 CONNECTIONS			
YIELDING	1,15.A		
3,4 CONNECTOR			
3.4.1 BOLTS			
YIELDING	1,16,A	1.6.3.A	1.5.2.B
3,4.2 RIVETS			
YIELDING	1,16.A	1.6.3.A	1.5.2.B
3.4.3 GROOVE WELD			
YIELDING	1,5.3.A		
3.4.4 PLUG/SLOT WELD			
YIELDING	1,5.3.A		
3,4.5 FILLET WELD			
YIELDING	1,5.3.A	1,17.A	
3.4.6 SHEAR CONNECTOR			
YIELDING	1,11,2.2.A		
4. TORSIONAL FORCE			
CONNECTIONS			
YIELDING	1,15,A		
5. BEARING			
5.1 ELEM. OF MEMB.			
BRG STIFFENERS			
5.1.1 YIELDING	1,5.1.5.A	1.10.5,1.A	
5.1.2 INSTABILITY			
GLOBAL	1,10.5.1.A		
5,2 CONNECTIONS			
YIELDING	1,15,A		
5,3 CONNECTOR			
5.3.1 BOLTS			
YIELDING	1,16,A	1,5.2.C	
5,3.2 RIVETS			
YIELDING	1,16.A	1.5.2.C	
5.3.3 BEARING SURFACE			
YIELDING	1,5.5.A		
5.3.4 PINS			
YIELDING	1,5.1.5,A		
5,3.5 ROLLER/ROCKER			
YIELDING	1,5.1.5.A		
6, COMBINED FORCES			
6,1 COMPR+BENDING			
MEMBERS			
6.1.1 THIN-WALL SHAPE			
6.1.1,1 YIELDING	1,6.1.A	1.6.1.B	
6.1.1.2 INSTABILITY			
6,1.1.2.1 GLOBAL	1,6.1.A	1.6.1.B	2.4.A
6,1.1.2.2 LOCAL	1.6.1.A	1.6.1.B	2.4.A
6.1.2 SOLID SHAPES			
6.1.2,1 YIELDING	1,6.1.A	1,6.1.B	
6.1.2,2 INSTABILITY			
GLOBAL	1,6.1.A	1.6.1.B	2.4.A
6,2 TENSION+BENDING			
MEMBERS			
6,2.1 THIN-WALL SHAPE			

6.2.1.1 YIELDING	1.6.2.A
6.2.1.2 INSTABILITY	
LOCAL	1.6.2.A
6.2.2 SOLID SHAPES	
YIELDING	1.6.2.A
6.3 SHEAR+BENDING	
CONNECTIONS	
YIELDING	1.15.A

SPECIFICATION OUTLINE ARRANGED BY

LIMIT STATES
STRESS STATES
COMPONENTS

1. YIELDING			
1.1 AXIAL FORCE			
1.1.1 TENSION			
1.1.1.1 MEMBERS			
1.1.1.1.1 THIN-WALL SHAPE	1.5.1.1.A		
1.1.1.1.2 SOLID SHAPES	1.5.1.1.A		
1.1.1.2 CONNECTIONS	1.15.A		
1.1.1.3 CONNECTOR			
1.1.1.3.1 BOLTS	1.6.3.A	1.5.2.A	
1.1.1.3.2 RIVETS	1.6.3.A	1.5.2.A	
1.1.1.3.3 GROOVE WELD	1.5.3.A		
1.1.2 COMPRESSION			
1.1.2.1 MEMBERS			
1.1.2.1.1 THIN-WALL SHAPE	1.5.1.3.A	2.3.A	
1.1.2.1.2 SOLID SHAPES	1.5.1.3.A	2.3.A	
1.1.2.2 ELEM. OF MEMB. BM/GRDR WEB	1.10.10.A		
1.1.2.3 CONNECTIONS	1.15.A		
1.1.2.4 CONNECTOR GROOVE WELD	1.5.3.A		
1.2 FLEXURAL FORCE			
1.2.1 MEMBERS			
1.2.1.1 THIN-WALL SHAPE	1.5.1.4.A		
1.2.1.2 SOLID SHAPES	1.5.1.4.A		
1.2.1.3 ENCASED COMP.	1.11.2.1.A		
1.2.1.4 NON-ENC. COMP.	1.11.2.2.A		
1.2.2 CONNECTIONS	1.15.A		
1.3 SHEARING FORCE			
1.3.1 MEMBERS			
1.3.1.1 THIN-WALL SHAPE	1.5.1.2.A		
1.3.1.2 SOLID SHAPES	1.5.1.2.A		
1.3.2 ELEM. OF MEMB. BM/GRDR WEB	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
1.3.3 CONNECTIONS	1.15.A		
1.3.4 CONNECTOR			
1.3.4.1 BOLTS	1.16.A	1.6.3.A	1.5.2.B
1.3.4.2 RIVETS	1.16.A	1.6.3.A	1.5.2.B
1.3.4.3 GROOVE WELD	1.5.3.A		
1.3.4.4 PLUG/SLOT WELD	1.5.3.A		
1.3.4.5 FILLET WELD	1.5.3.A	1.17.A	
1.3.4.6 SHEAR CONNECTOR	1.11.2.2.A		
1.4 TORSIONAL FORCE CONNECTIONS	1.15.A		
1.5 BEARING			
1.5.1 ELEM. OF MEMB. BRG STIFFENERS	1.5.1.5.A	1.10.5.1.A	
1.5.2 CONNECTIONS	1.15.A		
1.5.3 CONNECTOR			
1.5.3.1 BOLTS	1.16.A	1.5.2.C	
1.5.3.2 RIVETS	1.16.A	1.5.2.C	
1.5.3.3 BEARING SURFACE	1.5.5.A		
1.5.3.4 PINS	1.5.1.5.A		
1.5.3.5 ROLLER/ROCKER	1.5.1.5.A		
1.6 COMBINED FORCES			
1.6.1 COMPR+BENDING			

MEMBERS				
1.6.1.1 THIN-WALL SHAPE	1.6.1.A	1.6.1.B		
1.6.1.2 SOLID SHAPES	1.6.1.A	1.6.1.B		
1.6.2 TENSION+BENDING				
MEMBERS				
1.6.2.1 THIN-WALL SHAPE	1.6.2.A			
1.6.2.2 SOLID SHAPES	1.6.2.A			
1.6.3 SHEAR+BENDING				
CONNECTIONS	1.15.A			
2. INSTABILITY				
2.1 GLOBAL				
2.1.1 AXIAL FORCE				
COMPRESSION				
2.1.1.1 MEMBERS				
2.1.1.1.1 THIN-WALL SHAPE	1.5.1.3.A	2.4.A	2.3.A	
2.1.1.1.2 SOLID SHAPES	1.5.1.3.A	2.4.A	2.3.A	
2.1.1.2 ELEM. OF MEMB.				
BM/GRDR WEB	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
2.1.2 FLEXURAL FORCE				
MEMBERS				
2.1.2.1 THIN-WALL SHAPE	1.5.1.4.A	2.9.A		
2.1.2.2 SOLID SHAPES	1.5.1.4.A	2.9.A		
2.1.3 BEARING				
ELEM. OF MEMB.				
BRG STIFFENERS	1.10.5.1.A			
2.1.4 COMBINED FORCES				
COMPR+BENDING				
MEMBERS				
2.1.4.1 THIN-WALL SHAPE	1.6.1.A	1.6.1.B	2.4.A	
2.1.4.2 SOLID SHAPES	1.6.1.A	1.6.1.B	2.4.A	
2.2 LOCAL				
2.2.1 AXIAL FORCE				
COMPRESSION				
MEMBERS				
THIN-WALL SHAPE	1.5.1.3.A	2.4.A		
2.2.2 FLEXURAL FORCE				
MEMBERS				
2.2.2.1 THIN-WALL SHAPE	1.5.1.4.A			
2.2.2.2 NON-ENC. COMP.	1.11.2.2.A			
2.2.3 COMBINED FORCES				
2.2.3.1 COMPR+BENDING				
MEMBERS				
THIN-WALL SHAPE	1.6.1.A	1.6.1.B	2.4.A	
2.2.3.2 TENSION+BENDING				
MEMBERS				
THIN-WALL SHAPE	1.6.2.A			

SPECIFICATION OUTLINE ARRANGED BY

LIMIT STATES
COMPONENTS
STRESS STATES

1. YIELDING			
1.1 MEMBERS			
1.1.1 THIN-WALL SHAPE			
1.1.1.1 AXIAL FORCE			
1.1.1.1.1 TENSION	1.5.1.1.A		
1.1.1.1.2 COMPRESSION	1.5.1.3.A	2.3.A	
1.1.1.2 FLEXURAL FORCE	1.5.1.4.A		
1.1.1.3 SHEARING FORCE	1.5.1.2.A		
1.1.1.4 COMBINED FORCES			
1.1.1.4.1 COMPR+BENDING	1.6.1.A	1.6.1.B	
1.1.1.4.2 TENSION+BENDING	1.6.2.A		
1.1.2 SOLID SHAPES			
1.1.2.1 AXIAL FORCE			
1.1.2.1.1 TENSION	1.5.1.1.A		
1.1.2.1.2 COMPRESSION	1.5.1.3.A	2.3.A	
1.1.2.2 FLEXURAL FORCE	1.5.1.4.A		
1.1.2.3 SHEARING FORCE	1.5.1.2.A		
1.1.2.4 COMBINED FORCES			
1.1.2.4.1 COMPR+BENDING	1.6.1.A	1.6.1.B	
1.1.2.4.2 TENSION+BENDING	1.6.2.A		
1.1.3 ENCASED COMP. FLEXURAL FORCE	1.11.2.1.A		
1.1.4 NON-ENC. COMP. FLEXURAL FORCE	1.11.2.2.A		
1.2 ELEM. OF MEMB.			
1.2.1 BRG STIFFENERS BEARING	1.5.1.5.A	1.10.5.1.A	
1.2.2 BM/GRDR WEB			
1.2.2.1 AXIAL FORCE COMPRESSION	1.10.10.A		
1.2.2.2 SHEARING FORCE	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
1.3 CONNECTIONS			
1.3.1 AXIAL FORCE			
1.3.1.1 TENSION	1.15.A		
1.3.1.2 COMPRESSION	1.15.A		
1.3.2 FLEXURAL FORCE	1.15.A		
1.3.3 SHEARING FORCE	1.15.A		
1.3.4 TORSIONAL FORCE	1.15.A		
1.3.5 BEARING	1.15.A		
1.3.6 COMBINED FORCES SHEAR+BENDING	1.15.A		
1.4 CONNECTOR			
1.4.1 BOLTS			
1.4.1.1 AXIAL FORCE TENSION	1.6.3.A	1.5.2.A	
1.4.1.2 SHEARING FORCE	1.16.A	1.6.3.A	1.5.2.B
1.4.1.3 BEARING	1.16.A	1.5.2.C	
1.4.2 RIVETS			
1.4.2.1 AXIAL FORCE TENSION	1.6.3.A	1.5.2.A	
1.4.2.2 SHEARING FORCE	1.16.A	1.6.3.A	1.5.2.B
1.4.2.3 BEARING	1.16.A	1.5.2.C	
1.4.3 GROOVE WELD			
1.4.3.1 AXIAL FORCE			
1.4.3.1.1 TENSION	1.5.3.A		

1.4.3.1.2 COMPRESSION	1.5.3.A			
1.4.3.2 SHEARING FORCE	1.5.3.A			
1.4.4 PLUG/SLOT WELD				
SHEARING FORCE	1.5.3.A			
1.4.5 FILLET WELD				
SHEARING FORCE	1.5.3.A	1.17.A		
1.4.6 SHEAR CONNECTOR				
SHEARING FORCE	1.11.2.2.A			
1.4.7 BEARING SURFACE				
BEARING	1.5.5.A			
1.4.8 PINS				
BEARING	1.5.1.5.A			
1.4.9 ROLLER/ROCKER				
BEARING	1.5.1.5.A			
2. INSTABILITY				
2.1 GLOBAL				
2.1.1 MEMBERS				
2.1.1.1 THIN-WALL SHAPE				
2.1.1.1.1 AXIAL FORCE				
COMPRESSION	1.5.1.3.A	2.4.A	2.3.A	
2.1.1.1.2 FLEXURAL FORCE	1.5.1.4.A	2.9.A		
2.1.1.1.3 COMBINED FORCES				
COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A	
2.1.1.2 SOLID SHAPES				
2.1.1.2.1 AXIAL FORCE				
COMPRESSION	1.5.1.3.A	2.4.A	2.3.A	
2.1.1.2.2 FLEXURAL FORCE	1.5.1.4.A	2.9.A		
2.1.1.2.3 COMBINED FORCES				
COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A	
2.1.2 ELEM. OF MEMB.				
2.1.2.1 BRG STIFFENERS				
BEARING	1.10.5.1.A			
2.1.2.2 BM/GRDR WEB				
AXIAL FORCE				
COMPRESSION	1.10.10.A	1.10.5.2.B	1.10.5.2.C	1.10.5.2.A
2.2 LOCAL				
MEMBERS				
2.2.1 THIN-WALL SHAPE				
2.2.1.1 AXIAL FORCE				
COMPRESSION	1.5.1.3.A	2.4.A		
2.2.1.2 FLEXURAL FORCE	1.5.1.4.A			
2.2.1.3 COMBINED FORCES				
2.2.1.3.1 COMPR+BENDING	1.6.1.A	1.6.1.B	2.4.A	
2.2.1.3.2 TENSION+BENDING	1.6.2.A			
2.2.2 NON-ENC. COMP.				
FLEXURAL FORCE	1.11.2.2.A			

APPENDIX B

TEXTUAL FORMAT CORRESPONDING TO COMPUTATIONAL STEPS OF TABLE 4.11

In Section 4.2.2, organization of a functional network for conditional execution was discussed. In this appendix, a textual format corresponding to the computational steps of Table 4.11, "Compression Member Check," is presented. Portions of the text taken verbatim from the present Specification are enclosed by quotation marks. The text reads as follows:

1. Axially Loaded Compression members are considered to be satisfactory if:
   a) Slenderness ratio as defined in Section 1.1 is not exceeded,
   b) Width-thickness ratios defined in Section 1.2 are not exceeded or reductions in design properties are applied in Section 1.3, and
   c) Stress ratio, R_a, defined in Section 1.3 is not exceeded.

1.1 Slenderness ratio is not exceeded if $K\ell/r \leq 200$. "In determining the slenderness ratio of an axially loaded compression member, the length shall be taken as its effective length $K\ell$," where ℓ is the actual unbraced length, and K is a factor as defined below for trusses or frames with sidesway prevented or for sidesway not prevented. The corresponding radius of gyration is r.

Trusses or frames with sidesway prevented:

"In frames where lateral stability is provided by adequate attachment to diagonal bracing, shear walls, an adjacent structure having adequate lateral stability, or to floor slabs or roof decks secured horizontally by walls or bracing systems parallel to the plane of the frame, and in trusses, the effective length factor, K, for the compression members shall be taken as unity, unless analysis shows that a smaller value may be used."

Frames with sidesway not prevented:

"In frames where lateral stability is dependent upon the bending stiffness of rigidly connected beams and columns, the effective length $K\ell$ of compression members, shall be determined by a rational method and shall not be less than the actual unbraced length."

1.2 Width-thickness ratios must be satisfied for all stiffened elements under compression as defined in Section 1.2.1 and unstiffened elements under compression as defined in Section 1.2.2, or else the design stress shall be modified.

1.2.1 Stiffened Elements Under Compression

a) "Stiffened compression elements are those having lateral support along both edges which are parallel to the direction of the compression stress. The width of such elements shall be taken as the distance between nearest lines of fasteners or welds, or between the roots of the flanges in the case of rolled sections."

b) "Stiffened elements subject to axial compression, or to uniform compression due to bending as in the case of the flange of a flexural member, shall be considered as fully effective when the ratio of width to thickness is not greater than the following:

Flanges of square and rectangular sections of uniform thickness .... $238/\sqrt{F_y}$

Unsupported width of cover plates perforated with a succession of access holes .... $317/\sqrt{F_y}$

All other uniformly compressed stiffened elements .... $253/\sqrt{F_y}$

Except in the case of perforated cover plates, when the actual width-to-thickness ratio exceeds these values, the design shall be subject to additional constraints as specified in Section 1.3."

1.2.2 Unstiffened Elements Under Compression

a) "Unstiffened (projecting) compression elements are those having one free edge parallel to the direction of compression stress. The width of unstiffened plates shall be taken from the free edge to the first row of fasteners or welds; the width of legs of angles, channel and zee flanges, and stems of tees shall be taken as the full nominal dimension, the width of flanges of I-shape members and tees shall be taken as one-half the full nominal width. The thickness of a sloping flange shall be measured halfway between a free edge and the corresponding face of the web."

b) "Unstiffened elements subject to axial compression or compression due to bending shall be considered as fully effective when the ratio of width to thickness is not greater than the following:

Single-angle struts; double-angle struts with separators ...... $76.0/\sqrt{F_y}$

Struts comprising double angles in contact; angles or plates projecting from girders, columns or other compression members; compression flanges of beams; stiffeners on plate girders .... $95.0/\sqrt{F_y}$

Stems of tees .... $127/\sqrt{F_y}$

When the actual width-to-thickness ratio exceeds these values, the design stress shall be subject to additional constraints as specified in Section 1.3, but the following limiting proportions must be satisfied for Channels and Tees:"

Shape	Ratio of flange width to profile depth	Ratio of flange thickness to web or stem thickness
Built-up or Rolled Channels	≤ 0.25	≤ 3.0
	≤ 0.50	≤ 2.0
Built-up Tees	≤ 0.50	≤ 1.25
Rolled Tees	≤ 0.50	≤ 1.10

1.3 Stress ratio, $R_a = f_a/F_{as}$, is not exceeded if $R_a \leq 1.0$, where f_a is defined in Section 1.3.1 and F_{as} is defined in Section 1.3.2.

1.3.1 $f_a = P/A_g$ where P is force on element and A_g pertains to the area of the gross section.

"The gross section of a member at any point shall be determined by summing the products of the thickness and the gross width of each element as measured normal to the axis of the member."

1.3.2 On the gross section of axially loaded bracing and secondary members, when $\ell/r > 120$,

$$F_{as} = \frac{F_a}{1.6 - \frac{\ell}{200r}}$$

But, if $\ell/r < 120$, then $F_{as} = F_a$. F_a is computed as follows: "On the gross section of axially loaded compression members when $K\ell/r$, the largest effective slenderness ratio of any unbraced segment as defined in Sect. 1.8, is less than C_c:"

$$F_a = \frac{Q_s Q_a \left[1 - \frac{(K\ell/r)^2}{2C_c^2}\right] F_y}{\frac{5}{3} + \frac{3(K\ell/r)}{8C_c} - \frac{(K\ell/r)^3}{8C_c^3}}$$

If $K\ell/r$ exceeds C_c, then

$$F_a = \frac{12\pi^2 E}{23(K\ell/r)^2}$$

The slenderness ratio $K\ell/r$ is defined in Sect. 1.1 and Q_s, Q_a, and C_c are defined in Sects. 1.3.2.1, 1.3.2.2, and 1.3.2.3, respectively.

1.3.2.1 For sections consisting only of stiffened elements and/or unstiffened elements satisfying the width-thickness ratios of Sect. 1.2.2, Q_s shall be taken as 1.0. For unstiffened compression elements whose width-thickness ratio exceeds the applicable limit given in Sect. 1.2.2, the "value of Q_s shall be determined by Formulas (C2-1) to C2-6), as applicable, where b is the width of the unstiffened element as defined in Sect. 1.3.2.2.2."

For single angles: when $76.0/\sqrt{F_y} < b/t < 155\sqrt{F_y}$:

$$Q_s = 1.340 - 0.00447(b/t)\sqrt{F_y} \qquad \text{(C2-1)}$$

when $b/t \geq 155/\sqrt{F_y}$:

$$Q_s = 15{,}500/[F_y(b/t)^2] \qquad \text{(C2-2)}$$

For angles or plates projecting from columns or other compression members, and for compression flanges of girders:

When $95.0/\sqrt{F_y} < (b/t) \leq 176/\sqrt{F_y}$:

$$Q_s = 1.415 - 0.00437(b/t)\sqrt{F_y} \qquad \text{(C2-3)}$$

When $b/t > 176/\sqrt{F_y}$:

$$Q_s = 20{,}000/[F_y(b/t)^2] \qquad \text{(C2-4)}$$

For stems of tees:

When $127/\sqrt{F_y} < 176/\sqrt{F_y}$:

$$Q_s = 1.908 - 0.00715(b/t)\sqrt{F_y} \qquad \text{(C2-5)}$$

When $b/t \geq 176/\sqrt{F_y}$:

$$Q_s = 20{,}000/[F_y(b/t)^2] \qquad \text{(C2-6)}$$

However, the proportions of Channels and tees shall in any case conform to the limits given in Sect. 1.2.2."

1.3.2.2 For sections consisting only of unstiffened elements and/or stiffened elements satisfying the width-thickness ratios of Sect. 1.2.1, Q_s shall be taken as 1.0. For stiffened compression elements with width-thickness ratio exceeding allowable limits in Sect. 1.2.1,"the allowable axial stress F_a, as provided in Sect. C5, shall be subject to the form factor

$$Q_a = \frac{\text{effective area}}{\text{actual area}}$$

where the effective area is equal to the actual area less $\Sigma(b-b_e)t$." The actual area and effective area are defined in Sect. 1.3.2.2.1 and 1.3.2.2.2, respectively.

1.3.2.2.1 Actual area is determined by

$$A_{actual} = bt$$

1.3.2.2.2 Effective area is determined by

$$A_{eff} = b_e t$$

The full width, b, is effective if the width-thickness ratio of a stiffened element is satisfied in Sect. 1.2.1. Otherwise, "for the flanges of square and rectangular sections of uniform thickness:

$$b_e = \frac{253t}{\sqrt{f}} \; 1 - \left(\frac{50.3}{(b/t)\sqrt{f}}\right) \leq b \qquad (C3\text{-}1)$$

For other uniformly compressed elements:

$$b_e = \frac{253t}{\sqrt{f}} \; 1 - \left(\frac{44.3}{(b/t)\sqrt{f}}\right) \leq b \qquad (C3\text{-}2)$$

where

b = actual width of a stiffened compression element a as defined in Sect. 1.9.2.1,

t = its thickness,

f = compressive stress in the element computed on the basis of its section properties as provided hereinafter. In the case of axial loading and flexure on extreme fibers, $f = 0.6F_y Q_s$, except as otherwise provided for wind and seismic loading.

When the allowable stresses are increased due to wind or seismic loading, the effective width b_e shall be determined on the basis of 0.75 times the stress caused by wind or seismic loading acting alone or in combination with the design dead and live loading."

1.3.2.2.3 C_c is defined as

$$C_c = \sqrt{\frac{2\pi^2 E}{Q_s Q_a F_y}}$$

where Q_s and Q_a are defined previously in Sects. 1.3.2 and 1.3.2.2.

It should be recognized that section numbers for the text have been started with "1," but this was a rather arbitrary decision. Any consistent section numbering scheme could be chosen. Indentations of the sections correspond to levels of organization; they are shown here for clarity, but they would not appear in a final text.

APPENDIX C

DATA STRUCTURE FOR AISC SPECIFICATION

C.1 Tabulation of Data Items in the Functional Network

The data items composing the functional network, as discussed in Section 2.2, are listed alphabetically on the following pages. It is emphasized that the data structure presented in this section is tentative and will be continuously modified to reflect improvements in the decision tables, organizational models, and data management scheme. The properties of the data are given in the following order from left to right:

1) The first column contains the data item number;
2) The second column contains the mnemonic name of the data item;
3) The third column names the table or function that generates the data item (a blank means that the data is an input quantity);
4) The fourth column gives a description of the data item;
5) The fifth column contains the global level from input;
6) The sixth column gives the order that the data item is encountered if the entire functional network is organized for direct execution;
7) The seventh column contains a list of ingredients (by data number) for each data item (a zero entry means that the data item has no ingredients, i.e., it is an input quantity);
8) The eighth column contains the global level from output;
9) The ninth column gives the order that the data item is encountered if the entire functional network is organized for conditional execution; and
10) The tenth column contains a list of dependents (by data number) for each data item (a zero entry means that the data item has no dependents, i.e., it is an output quantity).

The first letter of each mnemonic name is used to identify the type of data item. The identification scheme is given below.

1) Data names beginning with the letter B are boolean data items, i.e., they may have the value "Yes" or "No;"

2) Data names beginning with the letter T are the design criteria (shown previously in Table 2.1) which may have the value "satisfactory" or "violated;"

3) Data items beginning with the letter V are vectors of boolean data items which compose a mutually exclusive set, i.e., one item of the set has the value "yes" and the rest have the value "no" (a listing of the vectors and their elements are given following the alphabetical listing of data);

4) Data items beginning with the letter X are numerical quantities generated by functions;

5) All other data items, not beginning with B, T, V, or X, are numerical quantities that are input by the user or computed in a decision table (if computed in a table, the table number will appear in column 3).

B
T
V
X

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
1	A		STIFFENER SPACING	0	174	0	5	176	270 396 42 97
2	A1		AREA IN TENSION	0	185	0	6	119	226
3	A2		AREA IN SHEARING	0	197	0	6	129	357
4	A3	1.16.2.AW	AREA IN BEARING	1	204	11 73 156 154	5	139	344
5	AB		NOMINAL AREA OF BOLT IN TENSION	0	186	0	6	118	425 201 226
6	ABCPN		SMALLEST NET WIDTH OF STIFFENED ELEMENT	0	1	0	10	370	7
7	ABEFF	1.9.2.2.AW.2	EFFECTIVE WIDTH	1	8	13 229 294 417 50 225 6	9	368	341
8	ABETA		BETA EQUAL TO STR/SS OR SEFF/SS	0	282	0	2	231	78
9	ABF		WIDTH OF COMPRESSION FLANGE	0	162	0	4	253	191 194
10	ABFUN		BF FOR UNSTIFFENED ELEMENT (> 2*ABUN)	0	290	0	2	223	85
11	ABL		LENGTH IN BEARING	0	201	0	6	142	4
12	ABRNG		BEARING AREA	0	362	0	3	109	222
13	ABST		ACTUAL WIDTH OF STIFFENED COMPRESSION ELEMENT	0	2	0	10	193	7 122 332 72 85 113
14	ABSTF		AREA OF BEARING STIFFENER	0	309	0	4	185	30
15	ABUN		ACTUAL WIDTH OF UNSTIFFENED COMPRESSION ELEMENT	0	18	0	8	197	131 249 71 72 113 191 194
16	AC		ACTUAL AREA OF EFFECTIVE CONCRETE FLANGE	0	256	0	6	275	112 380
17	AFC		AREA OF COMPRESSION FLANGE	0	59	0	5	252	86 43 190 191 192 194
18	AFLBMC		AREA OF BEAM COMPRESSION FLANGE CONNECTED TO COLUMN	0	134	0	2	391	123
19	AFLBMT		AREA OF BEAM TENSION FLANGE CONNECTED TO COLUMN	0	135	0	2	390	123
20	AFT		AREA OF TENSION FLANGE	0	80	0	5	262	86
21	AGRS	1.14.BW.1	GROSS AREA	1	38	49 406 310 311 312	7	292	29 334 342 415
22	AGRSP		GROSS AREA MODIFIED	0	228	0	4	17	279 356 267
23	AGST		GROSS AREA OF STIFFENER	0	236	0	2	314	97
24	AKAY		DIST FROM OUTER FLANGE FACE TO WEB TOE OF FILLET	0	136	0	3	103	176 123
25	ALF		LOAD FACTOR	0	87	0	4	426	345
26	ALPHA		RATIO OF WEB YIELD STRESS TO FLANGE YIELD STRESS	0	60	0	5	342	192
27	AMM		MOMENT (LESS THE MAX MOMENT) AT A CONC LOAD POINT	0	283	0	2	230	78
28	AMMAX		MAXIMUM BENDING MOMENT	0	284	0	2	229	78
29	ANETP	1.14.AW.1	NET AREA (MODIFIED)	4	179	21 105 334	3	290	355
30	APR1	1.10.5.1.AW.1	MODIFIED AREA OF BEARING STIFFENER	1	311	14 84 422	3	183	343
31	APY		PY (= AREA * FY)	0	296	0	2	215	138 267
32	AR		LEAST RADIUS OF GYRATION	0	24	0	7	214	185 349 116 186 191 256 267 282
33	AR1		R OF THE FLANGE + 1/3 WEB	0	83	0	4	251	190 191
34	AREA1		AREA OF SUPPORT	0	382	0	3	85	198
35	AREA2		AREA OF BEARING PLATE	0	383	0	3	81	354 198
36	AREAC		AREA OF COVER PLATES	0	171	0	2	351	43
37	ARX		RADIUS OF GYRATION ABOUT X-AXIS	0	104	0	1	354	259 260

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
38	ARY		RADIUS OF GYRATION IN Y-DIRECTION	0	94	0	2	22	171 259 260 265
39	AS		AREA OF STEEL BEAM	0	257	0	6	274	112 380
40	AW		AREA OF WEB	0	61	0	5	172	269 192 270
41	AXFRC		FACTORED AXIAL FORCE IN THE MEMBER	0	297	0	2	16	138 279 267
42	B102OK	1.10.2.AW	SECTION 1.10.2 SATISFACTORY	1	176	130 153 229 422 1	1	347	254
43	B103OK	1.10.3.AW	SECTION 1.10.3 SATISFACTORY	3	173	131 17 36 110	1	349	254
44	B19OK	1.9.AW	SECTION 1.9 SATISFACTORY	3	103	121 133 131 122	3	186	254 255 256 259 260 261 85 191 268
45	BA307C		A307 BOLTS INCLUDED IN THE CONNECTION	0	422	0	1	8	257
46	BA514		MATERIAL A514 STEEL	0	163	0	4	250	191 194
47	BAEN	1.15.AW.3	ACCOUNT FOR ECCENTRICITIES NECESSARY	1	150	100 70 80 288 69 88	1	378	258
48	BALTAP		INTEND STEEL BEAM TO RESIST MOMENT ALONE, ALT. APR	0	375	0	3	92	181 196
49	BANGLE		ELEMENT AN ANGLE	0	33	0	9	296	21 239
50	BAPDXC		USE OF APPENDIX C DESIRED	0	3	0	10	192	7 122 131 249
51	BAXSMC		AXIALLY STRESSED MEMBER CONNECTION	0	115	0	2	377	209 258
52	BBENTW		LOADING IN THE PLANE OF WEB	0	274	0	3	249	191
53	BBENTX		SECTION BENT ABOUT MAJOR AXIS	0	62	0	5	248	265 191 192 194
54	BBENTY		SECTION BENT ABOUT MINOR AXIS	0	164	0	4	247	191 194
55	BBJIC		BEARING JOINT IN THE COLUMN	0	116	0	2	412	209
56	BBJIM		BEARING JOINT IN COMPR MEMBER (OTHER THAN COLUMN)	0	117	0	2	411	209
57	BBJIT		TENSION FROM BENDING IN BEARING JOINT	0	118	0	2	410	209
58	BBPPW		BOLTS INSTALLED PRIOR TO WELDING	0	423	0	1	7	257
59	BBRCB		BRACING COMPONENT OF BEAM	0	419	0	1	15	279
60	BBRCG		BRACING COMPONENT OF GIRDER	0	420	0	1	14	279
61	BBRSOK	2.9.AW	STRESS REQUIREMENT IN BRACING SATISFACTORY	9	93	299 364 378 379	1	421	265
62	BBSTP		BEARING STIFFENERS PROVIDED	0	373	0	1	96	262
63	BBS7DD		BEAM SIZE DETERMINED BY DEFLECTION	0	111	0	3	400	65
64	BCBWD		COLUMN BRACED IN WEAK DIRECTION ONLY	0	299	0	2	21	171
65	BCCFR	1.15.4.AW	CONNECTION CHECKS FLEXIBLITY REQUIREMENTS	6	114	63 163 153 347 398	2	397	209 258
66	BCFSR		COMPRESSION FLANGE IS SOLID AND RECTANGULAR	0	81	0	5	261	86
67	BCFST		COMPRESSION FLANGE HAS STIFFENED ELEMENT(S)	0	158	0	5	259	72 113
68	BCFUNS		COMPRESSION FLANGE HAS UNSTIFFENED ELEMENT(S)	0	155	0	5	258	71 72 113
69	BCGAC		C. G. CONNECTORS ON GRAVITY AXIS	0	144	0	2	384	47
70	BCGCAC		C.G. OF CONNECTORS AND MEMBER CONCURRENT	0	145	0	2	383	47
71	BCHAB	1.5.1.4.3.AW	CHECKS SUB-PARAGRAPHS A & B OF SECTION 1.5.1.4.1	1	157	81 15 68 229 421	4	264	191 194
72	BCMPCT	1.5.1.4.1.AW.1	COMPACT SECTION	1	160	81 15 67 68 153 178 229 421 422 13 417	4	263	191 194
73	BCNTRC		COUNTERSUNK CONNECTOR	0	202	0	6	141	4
74	BCOLFG		CONSIDERING OPPOSITE LEGS OF THE ANGLE	0	42	0	9	305	239

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
75	BCSAOK	1.10.7.AW	COMBINED STRESS ACTION IN PLATE GIRDER WEB O.K.	6	231	229 347 375	1	315	270
76	BCSLRD		CHECK FOR SLENDERNESS DESIRED	0	251	0	2	283	116
77	BCTM		CONNECTION FOR TENSION MEMBER	0	213	0	3	333	425 427
78	BDCOK	1.11.4.BW	DISTRIBUTION OF CONNECTORS SATISFACTORY	1	288	111 8 27 28 172 173	1	225	268
79	BDSWG		DESIGNED SIZE OF WELD GIVEN	0	320	0	3	70	320
80	BECCEN		ECCENTRICITY GIVEN	0	146	0	2	382	47
81	BECCTW		FLANGES CONTINUOUSLY CONNECTED TO WEB(S)	0	156	0	5	257	71 72 113
82	BEMR		ENDS OF MEMBER RESTRAINED	0	69	0	4	30	150
83	BENDP		END PANEL	0	242	0	1	309	270
84	BENDST		END STIFFENER	0	310	0	4	184	30
85	BFDOK	2.7.AW	FLANGE DIMENSION SATISFACTORY	4	292	295 10 229 421 13 417 44	1	221	267
86	BFORM7	1.5.1.4.6.AW	FORMULA 1.5.7 APPLICABLE	1	82	17 20 66 93	4	260	190 191
87	BFRBFW		FULLY RESTRAINED BEAM FRAMED TO I OR H SHAPED COL	0	137	0	2	376	123 258
88	BFWCRS		FILLET WELD CONNECTION UNDER REPEATED STRESS	0	147	0	2	381	47
89	BGCOK	1.9.1.2.BW	GEOMETRICAL CONSTRAINTS SATISFIED	1	17	303 158 316 410 423	8	198	131 249
90	BGIRDC		GIRDER CONNECTION	0	119	0	2	409	209
91	BHSBIC		H.S. BOLTS INCLUDED IN THE CONNECTION	0	424	0	1	6	257
92	BHSC		HIGH STRENGTH CONNECTOR	0	189	0	6	133	188 251
93	BHYBRD		HYBRID CONSTRUCTION	0	63	0	5	246	86 195 191 192 194
94	BIFC		INTENDED AS FLEXIBLE CONNECTION	0	120	0	2	408	209
95	BINFW		INTERMITTENT FILLET WELD (BEING USED)	0	352	0	1	146	272
96	BINFWA	1.17.8.AW	INTERMITTENT FILLET WELD ALLOWED	3	328	202 218 320 399	1	168	272
97	BISSOK	1.10.5.4.AW	INTERMEDIATE STIFFENER SIZE SATISFACTORY	4	241	129 243 402 1 23 152 155 389 422	1	310	270
98	BJHFWO		JOINT HAS FILLET WELD ONLY	0	321	0	3	69	320
99	BKP		VALUE OF K PROVIDED	0	25	0	7	363	282
100	BMACJ		MEMBER AXES CONCURRENT AT JOINT	0	148	0	2	380	47
101	BMAINM		MAIN MEMBER	0	252	0	2	282	116
102	BMAROD		MEMBER A ROD	0	253	0	2	281	116
103	BMID		MOMENT OF INERTIA DESIRED	0	52	0	6	322	415
104	BMSTL		MEMBER SUBJECT TO TRANSVERSE LOADING BET. SUPPORTS	0	70	0	4	29	150
105	BNAD		NET AREA DESIRED	0	178	0	4	291	29
106	BNEWRK		NEW WORK	0	425	0	1	5	257
107	BPINHL		STRESS REQUIRED AT A PIN HOLE	0	246	0	3	288	199
108	BPWLH		PANEL WITH LARGE HOLES	0	243	0	1	308	270
109	BRINC		RIVETS INCLUDED IN THE CONNECTION	0	426	0	1	4	257
110	BRIVG		RIVETED GIRDER	0	172	0	2	350	43
111	BRPM		REGION OF POSITIVE MOMENT	0	285	0	2	228	78
112	BSCSFC	1.11.4.AW.1	SHEAR CONNECTORS SATISFACTORY FOR FULL CAPACITY	1	261	16 39 223 229 244 248	5	271	403

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
113	BSEMCM	1.5.1.4.1.AW.2	SEMI-COMPACT SECTION	1	161	81 15 67 68 153 178 229 421 422 13 417	4	255	191 194
114	BSHORP		SHORING PROVIDED	0	262	0	5	94	183 268 181 403
115	BSIRLH		SEGMENT IN THE REGION OF LAST HINGE	0	95	0	1	420	265
116	BSLROK	1.8.4.AW	EL/AR SATISFACTORY	1	254	102 76 32 101 164	1	280	278
117	BSNAPH		SEGMENT NOT ADJACENT TO A PLASTIC HINGE	0	96	0	1	419	265
118	BSSP		SIDE SWAY PREVENTED IN THE MEMBER	0	26	0	7	362	282
119	BSSPIF		SIDE SWAY PERMITTED IN THE FRAME	0	71	0	4	28	150
120	BSTAT		STATIC LOADING ONLY	0	209	0	5	126	200
121	BSTIF		STIFFENED ELEMENT	0	101	0	4	188	44
122	BSTOK	1.9.2.2.AW.1	STIFFENED ELEMENT O.K.(CHECKS SECTION 1.9.2.2)	1	100	13 229 294 417 50	4	189	44
123	BSTPN	1.15.AW.2	STIFFENER PROVISION NECESSARY	2	143	87 290 292 335 18 19 24 229 313 336 411 412 422 409	1	385	258
124	BSWOK	2.5.AW	SHEAR ON WEB SATISFACTORY	1	295	309 424 153 229 422	1	218	267
125	BSYMWB		SYMMETRY ABOUT PLANE OF WEB	0	275	0	3	245	191
126	BSYMX		SYMMETRY ABOUT MAJOR AXIS	0	165	0	4	244	191 194
127	BSYMY		SYMMETRY ABOUT MINOR AXIS	0	166	0	4	243	191 194
128	BTEFSP		THREADING EXCLUDED FROM SHEAR PLANES	0	192	0	5	207	201
129	BTFD		TENSION FIELD ACTION DESIRED	0	237	0	2	307	97 270
130	BTRSP		TRANSVERSE STIFFENERS PROVIDED	0	175	0	2	348	42
131	BUNOK	1.9.1.2.AW.1	UNSTIFFENED ELEMENT O.K. (CHECKS SECTION 1.9.1.2)	2	99	15 229 283 421 50 89	4	194	43 44
132	BUNRBM		UNRESTRAINED BEAM	0	151	0	1	375	258
133	BUNST		UNSTIFFENED ELEMENT	0	102	0	4	187	44
134	BUPLOK	1.17.12.AW.1	USE OF PLUG WELD PERMISSIBLE	1	393	144 317 323	1	65	280
135	BUSWOK	1.17.12.AW.3	USE OF SLOT WELD PERMISSIBLE	1	394	144 317 323	1	62	280
136	BVCMP		VALUE OF CM PROVIDED	0	72	0	4	27	150
137	BVFFBC		VALUE OF FBC PROVIDED BY RATIONAL ANALYSIS	0	276	0	3	242	191
138	BWDOK	2.7.BW	WEB DIMENSION SATISFACTORY	1	298	31 41 153 229 422	1	216	267
139	BWINC		WELD INCLUDED IN THE CONNECTION	0	427	0	1	3	257
140	BWMMSM		WELD MADE BY MANUAL SHIELDED METAL ARC PROCESS	0	334	0	4	164	175
141	BWMSA		WELD MADE BY SUBMERGED ARC PROCESS	0	335	0	4	163	175
142	BWOVRL		WELD OVERLAPPING	0	344	0	3	154	162
143	BWSDFT		WELD DESIGNED TO OBTAIN FULL THROAT THICKNESS	0	397	0	2	59	322
144	BWTS		WELD TRANSMITS SHEAR	0	390	0	2	61	134 135 321
145	C		(FT)BOLT/(FT)MEMBER	0	214	0	3	336	425
146	CB		FACTOR AS DEFINED IN SECTION 1.5.1.4.6A	0	84	0	4	428	190
147	CCP		CC FOR PLASTIC DESIGN	0	301	0	1	213	267
148	CKV	1.10.5.2.CW	CV FOR NO STIFFENERS AND K > 5.34	1	417	229 243 422	1	36	271
149	CM		CM (VALUE)	0	73	0	4	26	150
150	CMP	1.6.1.BW	CM'	1	76	119 104 169 170 136 149 82	3	23	378 267 279

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
151	CSPFS		NOMINAL CROSS SECTIONAL AREA OF THE SLOT OR HOLE	0	345	0	3	153	162
152	CV	1.10.5.2.AW	FACTOR DEFINED IN SECTION 1.10.5.2	3	235	339 340	2	173	269 97 270
153	D		DEPTH OF THE WEB	0	85	0	5	217	42 138 65 72 113 124 190 191 194
154	DCS		DEPTH OF COUNTER SUNK	0	203	0	6	140	4
155	DD		FACTOR DEPENDING UPON TYPE OF TRANSVERSE STIFFENER	0	238	0	2	313	97
156	DIA		D, THE DIAMETER OF THE CONNECTOR	0	49	0	7	132	4 331 333 334 251
157	DPIN		DIAMETER OF THE EXPANSION ROLLER OR ROCKER	0	357	0	3	113	197
158	DPR		PROFILE DEPTH OF T-SECTIONS	0	12	0	9	203	89
159	DSIZW		DESIGNED SIZE OF WELD (VALUE)	0	322	0	3	68	320
160	DTHGR		DEPTH OF GROOVE	0	336	0	4	162	175
161	E		E, MODULUS OF ELASTICITY	0	22	0	7	359	338 349 185
162	EAFW	1.14.7.AW.3	EFFECTIVE AREA OF WELD	2	347	307 165 175 296 142 151	2	151	358
163	EHDTF		E, THE HORIZONTAL DISPLACEMENT OF TOP FLANGE	0	112	0	3	399	65
164	EL		UNBRACED LENGTH OF THE COMPRESSION MEMBER	0	27	0	7	212	185 190 349 116 186 191 194 256 265 267 282
165	ELNTH	1.14.7.AW.2	EFFECTIVE LENGTH	1	333	307 247 394 315	3	165	162
166	ELRR		LENGTH OF ROLLER OR ROCKER IN INCHES	0	363	0	3	108	222
167	ELX		UNBRACED LENGTH IN X-DIRECTION	0	105	0	1	353	259 260
168	ELY		UNBRACED LENGTH IN Y-DIRECTION	0	106	0	2	20	171 259 260
169	EM1		SMALLER END MOMENT	0	74	0	4	25	337 150
170	EM2		LARGER END MOMENT	0	75	0	4	24	337 150
171	EMM	2.4.3.AW	MAX MOMENT POSSIBLE WITH ZERO AXIAL FORCE	1	300	64 212 38 168 229	1	18	267 279
172	EN1		N1 AS DEFINED IN SECTION 1.11-6 OF AISC SPEC	0	286	0	2	227	78
173	EN2		N2 AS DEFINED IN SECTION 1.11-6 OF AISC SPEC	0	287	0	2	226	78
174	ENB		LENGTH OF BEARING IN INCHES	0	367	0	3	102	176
175	ETRTH	1.14.7.AW.1	EFFECTIVE THROAT THICKNESS	1	343	307 141 393 394 405 414 301 418 160 308 140	3	155	162
176	FA2	1.10.10.AW.1	ACTUAL STRESS AT THE WEB TOE OF FILLET	1	370	24 174 204 298 422	2	99	362
177	FBASE		STRESS IN THE BASE MATERIAL	0	353	0	1	145	272
178	FBC		ACTUAL STRESS IN BENDING (COMPRESSION)	0	159	0	5	256	72 113
179	FBRSTF		FORCE ON THE STIFFENER	0	312	0	3	182	343
180	FCAL		CALCULATED FORCE	0	121	0	2	407	209
181	FCE	1.11.2.1.AW.1	ACTUAL STRESS IN THE EQUIVALENT STEEL BEAM	1	378	48 207 208 210 114	2	93	367
182	FCRT		PCR, MAX STRENGTH OF THE MEMBER (FROM 2.4-1)	0	302	0	1	13	267 279
183	FCU1	1.11.2.2.AW.3	STRESS IN COMPOSITE UN-ENCASED BEAM (TENSION)	4	271	114 206 210 403 377	2	268	368
184	FDEAD		FORCE AT JOINT DUE TO DEAD LOAD	0	122	0	2	406	209

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
185	FFA	1.5.1.3.AW.2	ALLOWABLE STRESS IN COMPRESSION	5	31	32 164 282 338 249 359 161	5	364	186
186	FFAP	1.5.1.3.AW.3	ALLOWABLE AXIAL COMPRESSION (MODIFIED)	6	32	300 185 32 161 164 282	4	357	360
187	FFAPD		FA FOR PLASTIC DESIGN BY FORMULA 1.5-1	0	303	0	1	211	267
188	FFB1	1.5.2.FW.2	ALLOWABLE STRESS IN CONNECTOR IN BEARING	1	207	92 291 229	4	136	363
189	FFBAS	1.5.1.PW	ALLOWABLE STRESS IN BASE MATERIAL	1	351	284	1	147	272
190	FFBBR	2.9.BW.2	ALLOWABLE BENDING STRESS IN BRACING	2	86	33 146 164 229 86 17 153	3	427	364
191	FFBC	1.5.1.4.AW.2	ALLOWABLE STRESS IN BENDING (COMPRESSION)	4	279	229 304 15 17 46 53 54 72 93 127 153 164 297 9 113 409 71 126 44 249 408 137 337 193 32 52 86 125 33	2	236	369 192
192	FFBCP	1.10.6.AW.3	ALLOWABLE STRESS IN BENDING (COMPRESSION) MODIFIED	1	67	304 53 93 243 422 17 40 26 191	4	341	365 195
193	FFBCV		THE VALUE PROVIDED (OF FFBC)	0	277	0	3	241	191
194	FFBT	1.5.1.4.AW.1	ALLOWABLE STRESS IN BENDING (TENSION)	2	168	229 304 15 17 46 53 54 72 93 127 153 164 297 9 113 409 71 126	3	267	368 195
195	FFBTP	1.10.6.AW.4	ALLOWABLE STRESS IN BENDING(TENSION) MODIFIED	3	169	93 194 192	2	340	366
196	FFCE	1.11.2.1.AW.2	ALLOWABLE STRESS IN THE EQUIVALENT STEEL BEAM	1	379	48 229 207 208 210	2	88	367
197	FFP	1.5.1.5.AW.2	ALLOWABLE STRESS IN BEARING	1	361	230 231 293 157	2	110	371
198	FFPMB	1.5.5.AW.2	ALLOWABLE STRESS ON MASONRY BEARING	1	385	287 34 35 223	2	82	372
199	FFT	1.5.1.1.AW.2	ALLOWABLE STRESS IN TENSION	1	249	107 229 227 302	2	285	373
200	FFT1	1.5.2.AW.2	ALLOWABLE STRESS IN CONNECTOR IN TENSION	2	210	286 289 306 357 120 251 229	4	123	374
201	FFV1	1.5.2.BW.2	ALLOWABLE STRESS IN CONNECTOR IN SHEAR (NON H.S.)	3	196	286 289 291 306 5 226 353 128 251 229	4	206	376
202	FFW		ALLOWABLE STRESS IN THE WELD	0	325	0	2	144	96 272
203	FLATRL		FORCE AT JOINT DUE TO LATERAL LOADING	0	123	0	2	405	209
204	FLOAD		CONCENTRATED LOAD OR REACTION	0	368	0	3	101	176
205	FLXM		FLEXURAL FORCE (I.E. BENDING MOMENT)	0	56	0	5	318	346 347
206	FMD		MD, LOAD APPLIED PRIOR TO HARDENING OF CONCRETE	0	263	0	5	235	183 348 403

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
207	FMD1		MD1, MOM DUE TO DEAD LOAD BEFORE HARDENING OF CONCRETE	0	376	0	3	91	181 196
208	FMD2		MD2, MOM DUE TO DEAD LOAD AFTER HARDENING OF CONCRETE	0	377	0	3	90	181 196
209	FMINC	1.15.AW.1	MINIMUM DESIGN FORCE FOR THE CONNECTION	7	128	57 290 55 56 219 65 94 252 180 51 90 401 184 203	1	401	258
210	FML		ML, MOMENT DUE TO LIVE LOAD	0	264	0	5	89	181 183 196 403
211	FMNT		FACTORED BENDING MOMENT FOR PLASTIC DESIGN	0	88	0	4	12	345 265 267 279
212	FMP		MP, PLASTIC MOMENT	0	97	0	2	19	171 265 267
213	FORCA		FORCE ON THE CONNECTION (ACTUAL)	0	152	0	1	374	258
214	FORCE		FORCE	0	39	0	5	76	222 342 354 355 356
215	FORCEB		FORCE ON THE CONNECTOR DUE TO BEARING	0	205	0	5	138	344
216	FORCEV		FORCE ON THE CONNECTOR DUE TO SHEAR	0	198	0	6	128	357
217	FORCEW		FORCE IN THE WELD	0	348	0	2	150	358
218	FORCI		FORCE ON THE WELDMENT IN INTERMITTENT FILLET WELD	0	326	0	2	170	96
219	FORCM		FORCE IN THE CONNECTED MEMBER	0	124	0	2	404	209
220	FOREXL		P1, EXTERNAL LOAD ON THE CONNECTOR	0	182	0	7	122	353
221	FORSP		FORCE DUE TO PRYING ACTION	0	183	0	7	121	353
222	FP	1.5.1.5.AW.1	ACTUAL STRESS IN BEARING	1	364	214 293 12 166	2	106	371
223	FPCON		FC: SPECIFIED COMPRESSIVE STRENGTH IN CONCRETE	0	258	0	6	84	112 380 198
224	FPE		MAX FORCE BY THE EULER:S FORMULA	0	304	0	1	11	267 279
225	FSTRS		F AS DEFINED IN APPENDIX C	0	4	0	10	369	7
226	FT1	1.5.2.AW.1	ACTUAL STRESS IN CONNECTOR IN TENSION (NON H.S.)	2	188	289 353 5 2	5	116	374 201
227	FTS		ULTIMATE TENSILE STRENGTH	0	247	0	3	287	199
228	FVWEB		SHEAR FORCE	0	244	0	1	35	269 271 270
229	FY		YIELD STRESS	0	5	0	10	10	7 42 75 112 122 131 138 148 190 191 194 196 199 249 269 271 279 338 339 340 350 351 352 379 380 71 72 85 113 123 124 171 188 200 201 261 265 270
230	FY1		YIELD STRESS OF ONE PART	0	358	0	3	112	197
231	FY2		YIELD STRESSOF ANOTHER PART	0	359	0	3	111	197
232	FYBMFL		YIELD STRESS OF BEAM FLANGE	0	129	0	3	396	335
233	FYCOL		YIELD STRESS OF COLUMN	0	130	0	3	394	335 336
234	FYSTIF		YIELD STRESS OF STIFFENER	0	132	0	3	393	336
235	G		GAGE SPACE BETWEEN RIVET HOLES	0	43	0	9	304	239

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
236	G1		GAGE SPACE FROM CORNER TO HOLE IN ONE LEG OF ANGLE	0	44	0	9	303	239
237	G2		GAGE SPACE FROM CORNER TO HOLE IN THE OTHER LEG OF A	0	45	0	9	302	239
238	GEDLS		GIVEN EDGE DISTANCE IN LINE OF STRESS	0	224	0	1	325	264
239	GK	1.14.CW.1	THE K TH GAGE SPACE	1	46	49 235 74 236 237 406	8	301	370
240	GPIT		GIVEN PITCH OF CONNECTORS	0	225	0	1	324	264
241	GRIPL		G, THE GRIP LENGTH	0	190	0	6	131	251
242	GROSI		MOMENT OF INERTIA OF GROSS SECTION	0	53	0	6	321	415
243	H		CLEAR DISTANCE BETWEEN FLANGES FOR BEAM OR GIRDER	0	64	0	5	34	97 148 270 271 339 340 396 192
244	NOCP		NUMBER OF CONNECTORS PROVIDED	0	259	0	6	273	112 381
245	NOFLS		NUMBER OF FASTENERS IN LINE OF STRESS	0	215	0	3	332	425 427
246	NU		NUMBER OF HOLES	0	50	0	7	298	334
247	OLFFW		OVERALL LENGTH OF THE FULL SIZE FILLET WELD	0	329	0	4	167	165
248	Q		CAPACITY OF A SINGLE CONNECTOR, FROM TABLE 1.11.4 OF T	0	260	0	6	272	112 381
249	QS	1.9.1.2.AW.2	FACTOR FOR STIFFENED COMPRESSION ELEMENTS	2	21	15 229 283 421 50 89	7	265	338 185 191
250	REDI		MOMENT OF INERTIA OF THE MODIFIED SECTION	0	54	0	6	320	415
251	RG	1.16.3.AW	GAGE SPACE BETWEEN RIVET HOLES	1	191	92 156 241	5	130	200 201
252	RSHR		REACTION SHEAR	0	125	0	2	403	209
253	TBEAR	1.5.1.5.A	BEARING CHECK	3	366	371	0	104	0
254	TBEND	1.5.1.4.A	BENDING CHECK	7	177	44 42 43 365 366	0	346	0
255	TCOMBS	1.10.5.1.A	COMPRESSION (BEARING STIFFENERS) CHECK	4	316	44 361	0	178	0
256	TCOMPR	1.5.1.3.A	COMPRESSION MEMBER CHECK	8	108	44 32 164 282 360	0	413	0
257	TCOMSG	1.15.B	HETEROGENEOUS CONNECTION	1	428	45 139 91 109 106 58 291	0	1	0
258	TCONCK	1.15.A	CONNECTION CHECK	8	153	209 213 51 123 290 65 87 132 47	0	372	0
259	TCSCR	1.6.1.A	CHECK OF COMBINED STRESS (COMPRESSION + BENDING)	9	107	44 37 38 167 168 378 379	0	414	0
260	TCSCPR	1.6.1.B	CHECK OF COMBINED STRESS (COMPR + BENDING, RA.LE.0.15)	8	154	44 37 38 167 168 360 365	0	352	0
261	TCSTB	1.6.2.A	CHECK OF COMBINED STRESS (TENSION + BENDING)	7	181	44 229 355 365 366	0	338	0
262	TCWTOF	1.10.10.A	CHECK OF COMPRESSION (WEB TOE OF FILLET)	3	374	362 62	0	95	0
263	TECOMB	1.11.2.1.A	CHECK OF ENCASED COMPOSITE BEAMS	3	381	367	0	86	0
264	TGEOMC	1.16.A	CHECK OF GEOMETRICAL REQUIREMENTS	7	226	238 240 330 331 333 427	0	323	0
265	TLBRAC	2.9.A	CHECK OF LATERAL BRACING	10	98	53 61 115 117 38 164 211 212 229	0	418	0
266	TMASBR	1.5.5.A	CHECK OF MASONRY BEARING	3	388	372	0	78	0

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
267	TMEMBR	2.4.A	MEMBER CHECK (PLASTIC DESIGN)	5	306	285 22 32 41 147 164 187 31 85 124 138 150 171 182 211 212 224	0	209	0
268	TNECOM	1.11.2.2.A	CHECK OF NON-ENCASED COMPOSITE BEAM	6	289	114 368 78 44 369	0	224	0
269	TSA514	1.10.5.2.B	CHECK OF SHEAR ON HYBRID/A514 STEEL GIRDER	4	317	40 152 228 229	0	171	0
270	TSBGST	1.10.5.2.C	CHECK OF SHEAR ON BEAMS/GIRDERS WITH STIFFENERS	7	245	1 243 422 40 83 108 129 228 152 229 75 97	0	306	0
271	TSBMGR	1.10.5.2.A	CHECK OF SHEAR ON BEAMS/GIRDERS	2	418	228 229 243 310 422 148	0	31	0
272	TSCWLD	1.5.3.A	STRESS CHECK IN WELDED CONNECTIONS	4	354	177 189 202 358 95 96	0	143	0
273	TSHEAR	1.5.1.2.A	SHEAR CHECK	3	389	375	0	73	0
274	TSNHSB	1.5.2.C	CHECK OF BEARING STRESS IN CONNECTOR	4	355	363	0	134	0
275	TSNHSC	1.6.3.A	CHECK OF COMBINED STRESS IN CONNECTOR	5	307	374 376	0	208	0
276	TSNHSS	1.5.2.B	CHECK OF SHEAR STRESS IN CONNECTOR	5	308	376	0	204	0
277	TSNHST	1.5.2.A	CHECK OF TENSION STRESS IN CONNECTOR	4	356	374	0	114	0
278	TTENSN	1.5.1.1.A	TENSION CHECK	7	255	116 373	0	279	0
279	TVBRAC	2.3.A	CHECK OF VERTICAL BRACING	2	421	22 41 59 60 229 150 171 182 211 224	0	9	0
280	TWELDC	1.17.A	GEOMETRY CHECK ON WELDED CONNECTIONS	3	416	307 320 322 394 134 314 324 325 326 382 385 388 135 318 319 321 327 328 329 383 384 386 387	0	37	0
281	UK		VALUE OF K	0	28	0	7	361	349 282
282	UKP	1.8.2.AW	K' (MODIFIED VALUE OF K)	1	30	300 99 118 281 32 164	6	360	185 256
283	VANGLE		TYPE OF UNSTIFFENED COMPRESSION ELEMENT	0	19	0	8	196	131 249
284	VBASE		TYPE OF STRESS IN BASE MATERIAL	0	350	0	2	148	189
285	VBGC		TYPE OF MEMBER (BEAM, COLUMN, OR GIRDER)	0	305	0	1	210	267
286	VBOLT		TYPE OF BOLT (A325, A449, A490)	0	193	0	5	125	200 201
287	VBRGSF		MATERIAL TYPE FOR MASONRY BEARING	0	384	0	3	83	198
288	VCANGL		SINGLE ANGLE, DOUBLE ANGLE, OR SIMILAR MEMBER	0	149	0	2	379	47
289	VCONN		TYPE OF RIVET OR NO H. S. BOLT	0	187	0	6	117	200 201 226
290	VCONT		TYPE OF CONNECTION (LACING, SAG BAR, GIRT, BEAM)	0	126	0	2	373	123 209 258
291	VCTYPE		BEARING TYPE OR FRICTION TYPE CONNECTION	0	194	0	5	?	425 427 188 201 257
292	VCWSL		STIFFENER LOCATION OPPOSITE TENSION OR COMPR FLANGE	0	138	0	2	389	123
293	VEXPND		BEARING SURFACE (ROLLER, ROCKER, PINNED OR BORED HOLE)	0	360	0	3	107	197 222
294	VFLNGE		FLANGE OF SQUARE/RECTANGULAR SECTION OR COVER PLATE	0	6	0	10	191	7 122
295	VFLNPL		FLANGE TYPE FOR PLASTIC DESIGN	0	291	0	2	222	85

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
296	VHOLSL		WELD IN HOLES OR SLOTS	0	346	0	3	152	162
297	VHRBU		HOT ROLLED SHAPE OR BUILT-UP MEMBER	0	167	0	4	240	191 194
298	VLOAD		TYPE OF LOAD (INTERIOR OR END REACTION)	0	369	0	3	100	176
299	VMSTRS		SIMPLE STRESS OR COMBINED STRESS IN MEMBER	0	92	0	2	422	61
300	VMTYPE		MEMBER CLASS (MAIN, SECONDARY, BRACING)	0	29	0	7	358	186 282
301	VPENW		PENETRATION OF WELD (PARTIAL OR COMPLETE)	0	337	0	4	161	175
302	VPINHL		STRESS AT PIN HOLE (EYE BAR, PLATE, BUILT-UP MEMBER)	0	248	0	3	286	199
303	VSECTN		TYPE OF UNSTIFFENED SECTION (CHANNEL, T-SECT)	0	13	0	9	202	89
304	VSHAPE		SHAPE OF MEMBER	0	65	0	5	239	191 192 194
305	VSHEAR		CONNECTOR IN SINGLE SHEAR OR DOUBLE SHEAR	0	216	0	3	335	425
306	VSTRSC		TYPE OF STRESS IN CONNECTOR	0	195	0	5	124	200 404 201
307	VWELD		TYPE OF WELD (FILLET, GROOVE, PLUG, SLOT)	0	330	0	4	47	162 165 175 280
308	VWLDSH		SHAPE OF WELD (SINGLE OR DOUBLE V, J, U, BEVEL)	0	338	0	4	160	175
309	VWREIN		TYPE OF WEB REINFORCEMENT (STIFFENING)	0	293	0	2	220	124
310	W		WIDTH OF THE ELEMENT (IN A PLATE OR SAME LEG)	0	34	0	8	33	271 21
311	W1		WIDTH OF ONE ANGLE LEG	0	35	0	8	295	21
312	W2		WIDTH OF THE OTHER ANGLE LEG	0	36	0	8	294	21
313	WDCCF		COLUMN WEB DEPTH CLEAR OF FILLETS	0	139	0	2	388	123
314	WDIAP		DIA OF PLUG WELD PERMISSIBLE	0	410	0	2	46	388 280
315	WDTH		WIDTH OF THE PART JOINED	0	331	0	4	166	165
316	WFL		FLANGE WIDTH OF T-SECTION	0	14	0	9	201	89
317	WJCBM		WELD JOINS COMPONENTS OF BUILT-UP MEMBERS	0	391	0	2	64	134 135
318	WLS		LENGTH OF SLOT WELD	0	412	0	1	45	280
319	WLSS		LONGITUDINAL SPACING OF SLOT WELD	0	413	0	1	44	280
320	WMNSF	1.17.5.AW.2	MIN SIZE OF FILLET WELD ALLOWED	2	324	98 79 159 420 428	2	66	96 280
321	WMNTH	1.17.12.AW.4	MIN THICKNESS OF SLOT WELD ALLOWED	1	396	144 413	1	60	280
322	WMXSF	1.17.6.AW	MAX SIZE OF FILLET WELD ALLOWED	1	399	407 143	1	57	280
323	WPBLP		WELD PREVENTS BUCKLING OF LAPPED PARTS	0	392	0	2	63	134 135
324	WSPP		SPACING OF PLUG WELD	0	414	0	1	43	280
325	WTHP		THICKNESS OF PLUG WELD	0	405	0	2	42	385 280
326	WTHPA	1.17.12.AW.2	THICKNESS OF PLUG WELD ALLOWED	1	400	413	1	56	280
327	WTHS		THICKNESS OF SLOT WELD	0	407	0	2	41	386 387 280
328	WTSS		TRANSVERSE SPACING OF SLOT WELD	0	415	0	1	40	280
329	WWS		WIDTH OF SLOT WELD	0	402	0	2	39	383 280
330	X1P	1.16.AW.3	MINIMUM EDGE DISTANCE	1	221	426	1	328	264
331	X3	1.16.AW.5	MAX EDGE DISTANCE IN LINE OF STRESS	1	222	156	1	327	264
332	XACASE	1.9.2.2.AW.4	ACTUAL AREA OF STIFFENED ELEMENT	1	10	13 417	8	366	359
333	XAMPIT	1.16.AW.1	ALLOWABLE MINIMUM PITCH	1	223	156	1	326	264
334	XANET	1.14.BW.2	NET AREA	3	51	21 156 246 370 406	6	297	29 415
335	XC1	1.15.AW.4	RATIO OF BEAM FLANGE TO COLUMN YIELD STRESSES	1	131	232 233	2	395	123
336	XC2	1.15.AW.5	RATIO OF COLUMN TO STIFFENER YIELD STRESSES	1	133	233 234	2	392	123
337	XCB	1.5.1.4.AW.3	FACTOR AS DEFINED IN SECTION 1.5.1.4.6A	1	273	169 170	3	254	191
338	XCC	1.5.1.3.AW.5	CC AS DEFINED IN APPENDIX C	4	23	161 229 249 359	6	371	185
339	XCV1	1.10.5.2.BW.2	CV BY THE FIRST FORMULA	2	233	229 243 396 422	3	177	152

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
340	XCV2	1.10.5.2.BW.3	CV BY THE SECOND FORMULA	2	234	229 243 396 422	3	174	152
341	XEASTE	1.9.2.2.AW.3	EFFECTIVE AREA OF STIFFENED ELEMENT	2	9	7 417	8	367	359
342	XFA	1.5.1.3.AW.1	ACTUAL STRESS IN COMPRESSION	2	40	21 214	4	356	360 378 379
343	XFA1	1.10.5.1.AW.2	STRESS IN BEARING STIFFENER	2	313	30 179	2	181	361
344	XFB1	1.5.2.FW.1	ACTUAL STRESS IN CONNECTOR IN BEARING (NON H.S.)	2	206	4 215	4	137	363
345	XFBBR	2.9.BW.1	ACTUAL BENDING STRESS IN BRACING	1	90	25 211 397	3	424	364
346	XFBC	1.10.6.AW.2	ACTUAL STRESS IN BENDING (COMPRESSION)	5	58	205 390 415	4	344	365
347	XFBT	1.10.6.AW.1	ACTUAL STRESS IN BENDING (TENSION)	5	110	205 391 415	3	316	75 366 65
348	XFCU2	1.11.2.2.AW.4	STRESS IN COMPOSITE UN-ENCASED BEAM (COMPRESSION)	1	280	206 400	2	233	369
349	XFEP	1.6.1.AW.3	EULER STRESS DIVIDED BY FACTOR OF SAFETY	1	77	32 161 164 281	3	417	378
350	XFFA1	1.10.5.1.AW.3	ALLOWABLE STRESS IN BEARING STIFFENER	1	314	229	2	180	361
351	XFFA2	1.10.10.AW.2	ALLOWABLE STRESS AT THE WEB TOE OF FILLET	1	371	229	2	98	362
352	XFFV	1.5.1.2.AW.2	ALLOWABLE STRESS IN SHEARING	1	227	229	3	77	375
353	XFORCT	1.5.2.AW.4	TOTAL FORCE ON H.S. CONN DUE TO EXT. LOADS AND PRYING	1	184	220 221	6	120	226 201
354	XFPMB	1.5.5.AW.1	ACTUAL STRESS ON MASONRY BEARING	1	386	35 214	2	80	372
355	XFT	1.5.1.1.AW.1	ACTUAL STRESS IN TENSION	5	180	29 214	2	289	373 261
356	XFV	1.5.1.2.AW.1	ACTUAL STRESS IN SHEARING	1	229	22 214	3	75	375
357	XFV1	1.5.2.BW.1	ACTUAL STRESS IN CONNECTOR IN SHEAR (NON H.S.)	1	199	3 216	5	127	376 200
358	XFW	1.5.3.AW.1	STRESS IN THE WELD	3	349	162 217	1	149	272
359	XQA	1.9.2.2.AW.5	FACTOR FOR UNSTIFFEND COMPRESSION ELEMENTS	3	11	332 341	7	365	338 185
360	XRA	1.5.1.3.AW.4	STRESS RATIO IN COMPRESSION	7	41	186 342	3	355	378 256 260
361	XRA1	1.10.5.1.AW.4	STRESS RATIO FOR BEARING STIFFENER	3	315	343 350	1	179	255
362	XRA2	1.10.10.AW.3	RA2 FOR WEB TOE OF FILLET (TABLE 1.10.10.A)	2	372	176 351	1	97	262
363	XRB1	1.5.2.FW.3	RB IN CONNECTOR (NON H.S.)	3	208	188 344	3	135	274 404
364	XRBBR	2.9.BW.3	STRESS RATIO IN BRACING	3	91	190 345	2	423	61
365	XRBC	1.10.6.AW.6	STRESS RATIO IN BENDING (COMPRESSION)	6	68	192 346	3	343	378 379 254 260 261
366	XRBT	1.10.6.AW.5	STRESS RATIO IN BENDING (TENSION)	6	170	195 347	1	339	254 261
367	XRCE	1.11.2.1.AW.3	STRESS RATIO FOR COMPOSITE ENCASED BEAM	2	380	181 196	1	87	263
368	XRCU1	1.11.2.2.AW.5	STRESS RATIO FOR COMPOSITE UN-ENCASE BEAM, TENSION	5	272	183 194	1	266	268
369	XRCU2	1.11.2.2.AW.6	STRESS RATIO FOR COMPOSITE UN-ENCASE BEAM, COMPR	5	281	191 348	1	232	268
370	XREDUC	1.14.CW.2	REDUCTION OF DEDUCTION DUE TO ZIG-ZAG HOLES	2	48	239 395	7	299	334
371	XRP	1.5.1.5.AW.3	STRESS RATIO IN BEARING	2	365	197 222	1	105	253
372	XRPMB	1.5.5.AW.3	STRESS RATIO FOR MASONRY BEARING	2	387	198 354	1	79	266
373	XRT	1.5.1.1.AW.3	STRESS RATIO IN TENSION	6	250	199 355	1	284	278
374	XRT1	1.5.2.AW.3	RT IN CONNECTOR (NON H.S.)	3	211	200 226	3	115	275 277 404
375	XRV	1.5.1.2.AW.3	STRESS RATIO IN SHEAR	2	230	352 356	2	74	273 75
376	XRV1	1.5.2.BW.3	RV IN CONNECTOR (NON H.S.)	4	200	201 357	3	205	275 276 404
377	XSEFF	1.11.2.2.AW.2	THE EFFECTIVE SECTION MODULUS	3	270	380 381 400 403	3	276	183
378	XSUM1	1.6.1.AW.1	LEFT SIDE OF EQUATION 1.6-1A	8	78	150 342 349 360 365	2	416	61 259
379	XSUM2	1.6.1.AW.1	LEFT SIDE OF EQUATION 1.6-1B	7	79	229 342 365	2	415	61 259
380	XVH	1.11.4.AW.2	TOTAL HORIZONTAL SHEAR POINTS OF MAX. POS. MOMENT	1	268	16 39 223 229	4	278	377
381	XVHP	1.11.4.AW.3.	HORIZONTAL SHEAR FOR INCOMPLETE COMPOSITE ACTION	1	269	244 248	4	277	377
382	XWMNDP	1.17.12.AW.5	MIN DIA OF PLUG WELD ALLOWED	1	401	413	1	55	280
383	XWMNTS	1.17.12.AW.11	MIN TRANSVERSE SPACING OF SLOT WELD ALLOWED	1	403	329	1	54	280
384	XWMNWS	1.17.12.AW.9	MIN WIDTH OF SLOT WELD ALLOWED	1	404	413	1	52	280

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
385	XWMXDP	1.17.12.AW.6	MAX DIA OF PLUG WELD ALLOWED	1	406	325	1	51	280
386	XWMXLS	1.17.12.AW.8	MAX LENGTH OF SLOT WELD ALLOWED	1	408	327	1	50	280
387	XWMXWS	1.17.12.AW.10	MAX WIDTH OF SLOT WELD ALLOWED	1	409	327	1	49	280
388	XWSPPA	1.17.12.AW.7	SPACING OF PLUG WELD ALLOWED	1	411	314	1	48	280
389	Y		RATIO OF YIELD STRESSES OF WEB TO STIFFENER STEEL	0	239	0	2	312	97
390	Y1		DISTANCE FROM NEUTRAL AXIS TO COMPRESSION FIBER	0	57	0	5	345	346
391	Y2		DISTANCE FROM NEUTRAL AXIS TO TENSION FIBER	0	109	0	4	317	347
392	ZSCOMP		SEC. MOD. OF COMPOSITE BEAM ALONE FOR BOTTOM FLANG	0	265	0	5	270	403
393	ZSHORE		SHORTEST DIS FROM ROOT TO FACE OF DIAGRAMATIC WELD	0	339	0	4	159	175
394	ZSIZEW		SIZE OF WELD	0	332	0	4	38	165 175 280
395	ZSK		THE K TH LONGITUDINAL PITCH	0	47	0	8	300	370
396	ZSMALK	1.10.5.2.BW.1	K, FACTOR AS DEFINED IN SECTION 1.10.5.2	1	232	1 243	4	175	339 340
397	ZSMP		SECTION MODULUS (PLASTIC)	0	89	0	4	425	345
398	ZSPANF		SPAN OF THE BEAM IN FEET	0	113	0	3	398	65
399	ZSPIFW		SPACING OF INTERMITTENT FILLET WELD	0	327	0	2	169	96
400	ZSS		SEC. MODULUS OF STEEL BEAM ALONE FOR BOTTOM FLANGE	0	266	0	5	234	348 377 403
401	ZSTCM		STRENGTH OF THE CONNECTED MEMBER	0	127	0	2	402	209
402	ZSTIW		MOMENT OF INERTIA OF STIFFENER, AXIS IN WEB PLANE	0	240	0	2	311	97
403	ZSTR	1.11.2.2.AW.1	THE TRANSFORMED SECTION MODULUS	2	267	112 392 114 206 210 400	4	269	377 183
404	ZSTRTC	1.5.2.PW	R, STRESS RATIO IN CONNECTOR	5	212	306 374 376 363	2	337	427
405	ZSZLEG		LEG SIZE OF THE WELD	0	340	0	4	158	175
406	ZT		THICKNESS	0	37	0	9	293	21 334 425 239
407	ZTCONP		THICKNESS OF CONNECTED PART	0	398	0	2	58	322
408	ZTD		TRANSVERSE DISTANCE OUT TO OUT OF WEBS IN A BOX	0	278	0	3	238	191
409	ZTF		THICKNESS OF FLANGE	0	140	0	4	237	123 191 194
410	ZTFL		FLANGE THICKNESS OF T-SECTIONS	0	15	0	9	200	89
411	ZTFLCR		THICKNESS OF COMPR. FLANGE DELIVERING CONC. LOAD	0	141	0	2	387	123
412	ZTFLTB		THICKNESS OF TENS. FLANGE DELIVERING CONC. LOAD	0	142	0	2	386	123
413	ZTHPSP		THICKNESS OF THE PART CONTAINING PLUG/SLOT WELD	0	395	0	2	53	321 326 382 384
414	ZTHRT		THEORTICAL THROAT THICKNESS	0	341	0	4	157	175
415	ZTIAN	1.14.AW.3	MOMENT OF INERTIA	4	55	21 103 334 250 242	5	319	346 347
416	ZTSP		TRANSVERSE SPACING OF FASTENERS	0	218	0	2	331	427
417	ZTST		TF, THICKNESS OF STIFFENED COMPRESSION ELEMENT	0	7	0	10	190	7 122 332 341 72 85 113
418	ZTT		THICKNESS OF THINNER PART JOINED	0	342	0	4	156	175
419	ZTTHIK		MATERIAL THICKNESS OF THE THICKER PART	0	318	0	4	72	428
420	ZTTHIN		MATERIAL THICKNESS OF THE THINNER PART	0	323	0	3	67	320
421	ZTUN		TF, THICKNESS OF UNSTIFFENED COMPRESSION ELEMENT	0	20	0	8	195	131 249 71 72 85 113
422	ZTW		WEB THICKNESS	0	66	0	5	32	30 42 138 148 176 270 271 339 340 72 97 113 123 124 192

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INPUT ORDER	INGREDIENTS	OUTPUT LEVEL	OUTPUT ORDER	DEPENDENTS
423	ZTWEB		WEB OR STEM THICKNESS OF T-SECTIONS	0	16	0	9	199	89
424	ZVU		SHEAR FOR PLASTIC DESIGN	0	294	0	2	219	124
425	ZX	1.16.AW.2	X, JUST A TEMPORARY VARIABLE	1	217	5 77 145 245 291 305 406	2	334	427
426	ZX1		MIN EDGE DIST (FROM TABLE 1.16.5 OF AISC SPEC)	0	219	0	2	329	330 427
427	ZX2	1.16.AW.4	MINIMUM EDGE DISTANCE IN LINE OF STRESS	6	220	77 245 291 426 404 416 425	1	330	264
428	ZXTEMP	1.17.5.AW.1	SIZE OF WELD FROM TABLE 1.17.5 OF AISC SPEC	1	319	419	3	71	320

V E C T O R   D A T A   I T E M S   A N D   E L E M E N T S

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
283	VANGLE	TYPE OF UNSTIFFENED COMPRESSION ELEMENT
	BDAS	DOUBLE ANGLE WITH SEPARATORS
	BSA	SINGLE ANGLE
	BSTRUT	STRUT COMPRISING DOUBLE ANGLE IN CONTACT
284	VBASE	TYPE OF STRESS IN BASE MATERIAL
	BBASBC	BASE MATERIAL IN BENDING (COMPRESSION SIDE)
	BBASBT	BASE MATERIAL IN BENDING (TENSION SIDE)
	BBASEC	BASE MATERIAL IN COMPRESSION
	BBASEP	BASE MATERIAL IN BEARING
	BBASES	BASE MATERIAL IN SHEAR
	BBASET	BASE MATERIAL IN TENSION
285	VBGC	TYPE OF MEMBER (BEAM, COLUMN, OR GIRDER)
	BBEAM	MEMBER A BEAM
	BCOL	COLUMNS
	BGIRDR	MEMBER A GIRDER
286	VBOLT	TYPE OF BOLT (A325, A449, A490)
	BA325	A325 BOLT
	BA449	A449 BOLT
	BA490	A490 BOLT

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
287	VBRGSF	MATERIAL TYPE FOR MASONRY BEARING
	BBSBCM	BEARING SURFACE - BRICK IN CEMENT MORTAR
	BBSCON	BEARING SURFACE CONCRETE
	BBSLS	BEARING SURFACE - LIME STONE
	BBSSS	BEARING SURFACE - SAND STONE
288	VCANGL	SINGLE ANGLE, DOUBLE ANGLE, OR SIMILAR MEMBER
	BCDA	CONNECTION FOR DOUBLE ANGLE
	BCSA	CONNECTION FOR SINGLE ANGLE
	BCSMBR	CONNECTION FOR SIMILAR MEMBER
289	VCONN	TYPE OF RIVET OR NO H. S. BOLT
	BA307	A307 BOLT
	BA5021	A502 GRADE 1, HOT DRIVEN RIVET
	BA5022	A502 GRADE 2 HOT DRIVEN RIVET
	BTPS	THREADED PARTS OF STEEL MEETING SECTION 1.4.1
290	VCONT	TYPE OF CONNECTION (LACING, SAG BAR, GIRT, BEAM)
	BBEAMC	BEAM CONNECTION
	BGIRDC	GIRDER CONNECTION
	BGIRTC	GIRT CONNECTION
	BLACC	LACING CONNECTION
	BSBC	SAG BAR CONNECTION
	BTRUSC	TRUSS CONNECTION
291	VCTYPE	BEARING TYPE OR FRICTION TYPE CONNECTION
	BBEARC	BEARING CONNECTION
	BFRICC	FRICTION CONNECTION
292	VCWSL	STIFFENER LOCATION OPPOSITE TENSION OR COMPR FLANGE
	BSTOCF	STIFFENER LOCATION OPPOSITE COMPRESSION FLANGE
	BSTOTF	STIFFENER LOCATION OPPOSITE TENSION FLANGE

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
293	VEXPND	BEARING SURFACE (ROLLER, ROCKER, PINNED OR BORED HOLE)
	BEXPR1	EXPANSION ROLLER
	BEXPRK	EXPANSION ROCKER
	BMILLD	MILLED SURFACE ETC.
294	VFLNGE	FLANGE OF SQUARE/RECTANGULAR SECTION OR COVER PLATE
	BFLRS	FLANGES OF RECTANGULAR SECTIONS
	BFLSS	FLANGES OF SQUARE SECTIONS
	BPCP	PERFORATED COVER PLATES
295	VFLNPL	FLANGE TYPE FOR PLASTIC DESIGN
	BCOVP	COVER PLATE
	BFBOX	FLANGE OF BOX SECTION
	BFRI	FLANGE OF ROLLED I SHAPE
	BFRWF	FLANGE OF ROLLED WIDE FLANGE SHAPE
	BFSBLT	FLANGE OF SIMILAR BUILT-UP SINGLE WEB SHAPE
296	VHOLSL	WELD IN HOLES OR SLOTS
	BWIHOL	WELD IN HOLES
	BWISLT	WELD IN SLOTS
297	VHRBU	HOT ROLLED SHAPE OR BUILT-UP MEMBER
	BHOTRM	HOT ROLLED MEMBER
	BLTUPM	BUILT-UP MEMBER
298	VLOAD	TYPE OF LOAD (INTERIOR OR END REACTION)
	BENDR	END REACTION
	BINTL	INTERIOR LOAD

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
299	VMSTRS	SIMPLE STRESS OR COMBINED STRESS IN MEMBER
	BCMSTM	COMBINED STRESS IN MEMBER
	BSMSTM	SIMPLE STRESS IN MEMBER
300	VMTYPE	MEMBER CLASS (MAIN, SECONDARY, BRACING)
	BBRACE	BRACING
	BMAINM	MAIN MEMBER
	BSECM	SECONDARY MEMBER
301	VPENW	PENETRATION OF WELD (PARTIAL OR COMPLETE)
	BCOMPW	COMPLETE PENETRATION WELD
	BPRTPW	PARTIAL PENETRATION WELD
302	VPINHL	STRESS AT PIN HOLE (EYE BAR, PLATE, BUILT-UP MEMBER)
	BPCPLT	STRESS REQD AT PIN HOLE IN PIN CONNECTED PLATE
	BEYERR	STRESS REQUIRED AT A PIN HOLE IN EYE BAR
	BPCBUM	STRESS REQD AT PIN HOLE IN BUILT-UP MEMBER
303	VSECTN	TYPE OF UNSTIFFENED SECTION (CHANNEL, T-SECT)
	BBLTPT	BUILT-UP T SECTION
	BCHNNL	CHANNEL SECTION
	BROLDT	ROLLED T-SECTION
304	VSHAPE	SHAPE OF MEMBER
	BBOX	BOX TYE FLEXURAL MEMBER
	BCHNNL	CHANNEL SECTION
	BISHPE	I-SHAPE MEMBER
	BSHSPE	H-SHAPE MEMBER
	BSRECB	SOLID RECTANGULAR BAR
	BSRNDB	SOLID ROUND BAR
	BSSB	SOLID SQUARE BAR

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
305	VSHEAR	CONNECTOR IN SINGLE SHEAR OR DOUBLE SHEAR
	BFDSH	FASTENER IN DOUBLE SHEAR
	BFSSH	FASTENER IN SINGLE SHEAR
306	VSTRSC	TYPE OF STRESS IN CONNECTOR
	BBERNG	BEARING STRESS IN THE CONNECTOR
	BCMSTC	COMBINED STRESS IN THE CONNECTOR
	BSHEAR	SHEAR STRESS IN THE CONNECTOR
	BTENSN	TENSION STRESS IN THE CONNECTOR
307	VWELD	TYPE OF WELD (FILLET, GROOVE, PLUG, SLOT)
	BFILW	FILLET WELD
	BGRVW	GROOVE WELD
	BPLUGW	PLUG WELD
	BSLOTW	SLOT WELD
308	VWLDSH	SHAPE OF WELD (SINGLE OR DOUBLE V, J, U, BEVEL)
	BDBVLW	DOUBLE BEVEL WELD
	BDJW	DOUBLE J WELD
	BDUW	DOUBLE U WELD
	BDVW	DOUBLE V WELD
	BSBVLW	SINGLE BEVEL WELD
	BSJW	SINGLE J WELD
	BSUW	SINGLE U WELD
	BSVW	SINGLE V WELD
309	VWREIN	TYPE OF WEB REINFORCEMENT (STIFFENING)
	BWRBDP	WEB REINFORCED BY DOUBLE PLATE
	BWRBDS	WEB REINFORCED BY DIAGONAL STIFFENER

C.2 Tabulation of Data Items in the Organizational Network

The data items composing the organizational network, as discussed in Section 2.3, are listed alphabetically on the following pages. The properties of the data are listed in the same order as for the functional network (Section A.1), except that the columns for Input Order and Output Order are omitted. Again, it is emphasized that the data structure presented herein is tentative as stated in Section B.1.

The identification scheme for the first letter of the data names is the same as for the functional network with the following addition: Data names beginning with the letter S are switching data generated in switching tables. These data point to the next table that should be executed.

A listing of vectors used in the organizational network is given after the data listing.

It should be noted that several data items are used in both the functional and organizational networks.

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INGREDIENTS	OUTPUT LEVEL	DEPENDENTS
1	AW		AREA OF WEB	0	0	2	21
2	BA514		MATERIAL A514 STEEL	0	0	4	22
3	BALT		ALTERNATE APPROACH DESIRED (I.E., FORMULA 1.6-2)	0	0	4	22
4	BEAWD		EFFECTIVE AREA OF WELD DESIRED	0	0	2	16
5	BHYBRD		HYBRID CONSTRUCTION	0	0	3	23
6	CKV		CV FOR NO STIFFENERS AND K > 5.34	0	0	4	22
7	FVWEB		SHEAR FORCE	0	0	2	21
8	FY		YIELD STRESS	0	0	2	21
9	H		CLEAR DISTANCE BETWEEN FLANGES FOR BEAM OR GIRDER	0	0	2	21
10	SALLOW	1.Y	SWITCH FOR ALLOWABLE STRESS DESIGN	2	18 69	6	12 15 24 40
11	SBRACE	2.Y	SWITCH FOR BRACING	3	19 56	1	39 53
12	SCOMB	1.11.X	WITCH FOR COMPOSITE CONSTRUCTION	3	10 57	1	37 42
13	SCOMPR	1.5.1.3.X	SWITCH FOR COMPRESSION MEMBER TYPE	5	26 64	1	29 30 36
14	SCONCK	1.15.Z	SWITCH FOR TYPE OF CONNECTION CHECK	4	15 58	1	31 32
15	SCPART	1.15.X	SWITCH FOR CONNECTION OF SINGLE CONNECTOR CHECK	3	10 60	3	14 23
16	SCSCB	1.6.1.X	WITCH FOR COMBINED STRESS (COMPRESSION + BENDING)	5	17 70 3	1	33 34
17	SCSTRS	1.6.X	SWITCH FOR COMBINED STRESS	4	24 61	2	16 35
18	SMAIN	1.X	WITCH FOR MAIN ENTRY	1	62	7	10 19
19	SPLAS	2.X	WITCH FOR PLASTIC DESIGN	2	18 65	2	11 41
20	SSA514	1.10.7.X	SWITCH FOR SHEAR STRESS (A514 STEEL GIRDER)	6	22 71	2	21 43
21	SSBMGR	1.10.5.2.X	SWITCH FOR SHEAR ON BEAMS/GIRDERS	7	9 20 22 72 1 6 7 8	1	44 45
22	SSHEAR	1.5.1.2.X	SWITCH FOR SHEAR	5	26 55 2 5	3	20 21 43 47
23	SSNGCO	1.15.Y	SWITCH FOR CHECK OF A SINGLE CONNECTOR	4	15 59 63 4	2	25 38 46 54
24	SSTEEL	1.5.X	SWITCH FOR STRUCTURAL STEEL OR CAST STEEL MEMBER	3	10 66	5	17 26
25	SSTRCK	1.5.2.X	SWITCH FOR STRESS CHECK (RIVET OR BOLTED CONNECTION)	5	23 67	1	48 49 50 51
26	SSTRSS	1.5.1.X	SWITCH FOR TYPE OF STRESS IN THE MEMBER	4	24 68	4	13 22 27 28 52
27	TBEAR	1.5.1.5.A	BEARING CHECK	5	26	0	0
28	TBEND	1.5.1.4.A	BENDING CHECK	5	26	0	0
29	TCOMBS	1.10.5.1.A	COMPRESSION (BEARING STIFFENERS) CHECK	6	13	0	0
30	TCOMPR	1.5.1.3.A	COMPRESSION MEMBER CHECK	6	13	0	0
31	TCOMSG	1.15.B	HETEROGENEOUS CONNECTION	5	14	0	0
32	TCONCK	1.15.A	CONNECTION CHECK	5	14	0	0
33	TCSCB	1.6.1.A	CHECK OF COMBINED STRESS (COMPRESSION + BENDING)	6	16	0	0
34	TCSCBR	1.6.1.B	CHECK OF COMBINED STRESS (COMPR + BENDING, RA.LE.0.15)	6	16	0	0
35	TCSTB	1.6.2.A	CHECK OF COMBINED STRESS (TENSION + BENDING)	5	17	0	0
36	TCWTOE	1.10.10.A	CHECK OF COMPRESSION (WEB TOE OF FILLET)	6	13	0	0
37	TECOMB	1.11.2.1.A	CHECK OF ENCASED COMPOSITE BEAMS	4	12	0	0
38	TGEOMC	1.16.A	CHECK OF GEOMETRICAL REQUIREMENTS	5	23	0	0
39	TLBRAC	2.9.A	CHECK OF LATERAL BRACING	4	11	0	0
40	TMASBR	1.5.5.A	CHECK OF MASONRY BEARING	3	10	0	0
41	TMEMBR	2.4.A	MEMBER CHECK (PLASTIC DESIGN)	3	19	0	0
42	TNECOM	1.11.2.2.A	CHECK OF NON-ENCASED COMPOSITE BEAM	4	12	0	0

DATA NO.	DATA NAME	SECTION (TABLE)	DATA DESCRIPTION	INPUT LEVEL	INGREDIENTS		OUTPUT LEVEL	DEPENDENTS
43	TSA514	1.10.5.2.B	CHECK OF SHEAR ON HYBRID/A514 STEEL GIRDER	7	20	22	0	0
44	TSBGST	1.10.5.2.C	CHECK OF SHEAR ON BEAMS/GIRDERS WITH STIFFENERS	8	21		0	0
45	TSBMGR	1.10.5.2.A	CHECK OF SHEAR ON BEAMS/GIRDERS	8	21		0	0
46	TSCWLD	1.5.3.A	STRESS CHECK IN WELDED CONNECTIONS	5	23		0	0
47	TSHEAR	1.5.1.2.A	SHEAR CHECK	6	22		0	0
48	TSNHSB	1.5.2.C	CHECK OF BEARING STRESS IN CONNECTOR	6	25		0	0
49	TSNHSC	1.6.3.A	CHECK OF COMBINED STRESS IN CONNECTOR	6	25		0	0
50	TSNHSS	1.5.2.B	CHECK OF SHEAR STRESS IN CONNECTOR	6	25		0	0
51	TSNHST	1.5.2.A	CHECK OF TENSION STRESS IN CONNECTOR	6	25		0	0
52	TTENSN	1.5.1.1.A	TENSION CHECK	5	26		0	0
53	TVBRAC	2.3.A	CHECK OF VERTICAL BRACING	4	11		0	0
54	TWELDC	1.17.A	GEOMETRY CHECK ON WELDED CONNECTIONS	5	23		0	0
55	VBGC		TYPE OF MEMBER (BEAM, COLUMN, OR GIRDER)	0	0		4	22
56	VBRACE		TYPE OF BRACING (VERTICAL OR LATERAL)	0	0		2	11
57	VCOMB		TYPE OF COMPOSITE BEAM (ENCASED OR NON-ENCASED)	0	0		2	12
58	VCONCK		DESIRE CHECK FOR CONNECTION LOAD OR DISTRIBUTION	0	0		2	14
59	VCONNR		TYPE OF CONNECTOR (RIVET, BOLT, OR WELD)	0	0		3	23
60	VCPART		DESIRE CHECK OF CONNECTION OR A SINGLE CONNECTOR	0	0		4	15
61	VCSTRS		TYPE OF COMBINED STRESS (COMPR+BENDING, TENS+BENDING)	0	0		3	17
62	VDESGN		DESIGN METHOD (ALLOWABLE STRESS OR PLASTIC DESIGN)	0	0		8	18
63	VGCSC		DESIRE GEOMETRY CHECK OR STRESS CHECK OF CONNECTOR	0	0		3	23
64	VMEMB		COMPRESSION MEMBER TYPE	0	0		2	13
65	VMPLAS		MEMBER OR BRACING	0	0		3	19
66	VMSTRS		SIMPLE STRESS OR COMBINED STRESS IN THE MEMBER	0	0		6	24
67	VSTRSC		TYPE OF STRESS IN CONNECTOR	0	0		2	25
68	VSTRSS		TYPE OF STRESS IN THE MEMBER	0	0		5	26
69	VTYPE		COMPONENT TO BE CHECKED	0	0		7	10
70	XRA		STRESS RATIO IN COMPRESSION	0	0		2	16
71	XRBT		STRESS RATIO IN BENDING (TENSION)	0	0		3	20
72	ZTW		WEB THICKNESS	0	0		2	21

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
55	VBGC	TYPE OF MEMBER (BEAM, COLUMN, OR GIRDER)
	BBEAM	MEMBER A BEAM
	BCOL	COLUMNS
	BGIRDR	MEMBER A GIRDER
56	VBRACE	TYPE OF BRACING (VERTICAL OR LATERAL)
	BLBR	LATERAL BRACING
	BVBR	VERTICAL BRACING
57	VCOMB	TYPE OF COMPOSITE BEAM (ENCASED OR NON-ENCASED)
	BECOMB	ENCASED COMPOSITE BEAM
	BNECB	NON-ENCASED COMPOSITE BEAM
58	VCONCK	DESIRE CHECK FUR CONNECTION LOAD OR DISTRIBUTION
	BCDIST	DESIRE CHECK FUR CONNECTION DISTRIBUTION
	BCLOAD	DESIRE CHECK FOR CONNECTION LOAD
59	VCONNR	TYPE OF CONNECTOR (RIVET, BOLT, OR WELD)
	BCAB	CONNECTOR A BOLT
	BCAR	CONNECTOR A RIVET
	BCIW	CONNECTOR IS WELD

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
60	VCPART	DESIRE CHECK OF CONNECTION OR A SINGLE CONNECTOR
	BCONTN	DESIRE CHECK OF A CONNECTION
	BCONTR	DESIRE CHECK OF A SINGLE CONNECTOR
61	VCSTRS	TYPE OF COMBINED STRESS (COMPR+BENDING, TENS+BENDING)
	BCBSTR	COMPRESSION + BENDING STRESS
	BTBSTR	TENSION + BENDING STRESS
62	VDESGN	DESIGN METHOD (ALLOWABLE STRESS OR PLASTIC DESIGN)
	BALSTD	ALLOWABLE STRESS DESIGN
	BPLSD	PLASTIC DESIGN
63	VGCSC	DESIRE GEOMETRY CHECK OR STRESS CHECK OF CONNECTOR
	BGCD	GEOMETRY CHECK DESIRED
	BSCD	STRESS CHECK DESIRED
64	VMEMB	COMPRESSION MEMBER TYPE
	BAXCM	AXIALLY LOADED COMPRESSION MEMBER
	BBRGST	BEARING STRESS
	BWEBB	WEB OF BEAM
	BWEBG	WEB OF GIRDER
65	VMPLAS	MEMBER OR BRACING
	BBRCNG	BRACING
	BMBR	MASONRY BEARING
66	VMSTRS	SIMPLE STRESS UR COMBINED STRESS IN MEMBER
	BCMSTM	COMBINED STRESS IN MEMBER
	BSMSTM	SIMPLE STRESS IN MEMBER

DATA NO.	VECTOR NAME	VECTOR DESCRIPTION
67	VSTRSC	TYPE OF STRESS IN CONNECTOR
	BBERNG	BEARING STRESS IN THE CONNECTOR
	BCMSTC	COMBINED STRESS IN THE CONNECTOR
	BSHEAR	SHEAR STRESS IN THE CONNECTOR
	BTENSN	TENSION STRESS IN THE CONNECTOR
68	VSTRSS	TYPE OF STRESS IN THE MEMBER
	BBENST	BENDING STRESS
	BBRGST	BEARING STRESS
	BCOMST	COMPRESSION STRESS
	BSHEST	SHEAR STRESS
	BTENST	TENSION STRESS
69	VTYPE	COMPONENT TO BE CHECKED
	BCOM	COMPOSITE CONSTRUCTION MEMBER
	BCON	CONNECTION
	BCSM	CAST STEEL MEMBER
	BMBR	MASONRY BEARING
	BSSM	STRUCTURAL STEEL MEMBER