DRAFT PUBLIC REVIEW COMMENTS

(Public Review Period: May 1 to June 15, 2020)

Public Reviewer: Peter Maranian

Section of PR Draft	Line Number of PR Draft	Comment	Background/ Rationale	COMMITTEE RESPONSE	FINAL REVIEWER RESPONSE (enter "Resolved" or "Unresolved")
A4.1	120	Further statement should be made. Recommend adding; "Degradation includes but not limited to corrosion, damage from past seismic or wind events (e.g. defective and/or damaged welds), fractures, local buckling, etc."	Regarding past seismic or wind events, an approximate assessment must be made as to the past significant events that the building has experienced. This is to establish the cyclic history for both high cycle (wind) and low cycle (seismic) occurrences to determine available fracture résistance based upon Fracture Mechanics procedures. Refer to Kanvinde et al (2018), Partridge et al (2000).	Thank you for your comments. The existing language of the provisions in Section A4.1 sufficiently addresses the specific concerns raised by this comment.	Unresolved: The existing language does not appear to address the issues raised.
A4.1	120	Also, it needs to be determined, following a past event, if the building was inspected and if damaged how repaired. Thus add; "Determine if the inspected building was inspected and whether or not damage occurred following a past event. If damaged and repaired what was the extent of the damage and how repaired."	For example, some damaged buildings may only have involved restoring CJP welds for beam flanges to column flanges, others may have involved extensive repairs due to cracks through columns. Refer to Maranian and Dhalwala (2019).	The existing language of the provisions in Section A4.1 sufficiently addresses the specific concerns raised by this comment.	Unresolved: The existing language does not appear to address the issues raised.

A4.2	**139**	The title should be changed to "Condition Assessment". Add; "If the structure has experienced significant past seismic events and has not been inspected in accordance with FEMA 352, then an inspection shall be carried out in accordance with FEMA 352 including use of radiographic testing and/or ultrasonic testing."	The Term Visual Assessment may not be sufficient.	The term visual assessment is consistent with terminology in ASCE 41 and should be retained. Regarding the proposed sentence, FEMA documents should not be referenced in the provisions of this consensus standard. This information will be considered for addition in a future edition of the Commentary.	Unresolved: The writers look forward to consideration in the next addition of the item raised.
A4.4	**155**	Add: "…bolt sizes and grades, rivets sizes and grades, and weld sizes"	Refer to Maranian and Dhalwala (2019).	The scope set by the current language of this section is sufficient, including direction to determine the size and thickness of connecting materials.	Resolved.
A4.4	**156**	Add: "… b/t and d/t properties as needed assess potential local buckling"	Refer to Maranian and Dhalwala (2019).	The scope set by the current language of this section is sufficient, including direction to determine the size and thickness of connecting materials.	Resolved.
A4.4	**157**	Add: "… including size of copes, access holes, back up plates, reinforcing fillets, alignment of continuity plates with flanges and the like."	Refer to Maranian and Dhalwala (2019).	The scope set by the current language of this section is sufficient, including direction to determine the size and thickness of connecting materials.	Unresolved: The writers consider these important issues. Refer to Maranian and Dhalwala (2019).
A4.4	**159**	Add: "To the extent that it can be determined, establish weld processes used both in the shop and field (e.g. SMAW, GMAW, FCAWs, Electro slag)	Refer to Maranian and Dhalwala (2019).	Sufficient direction on assessing existing welds is set forth in Sections A5.2, A5.3, and A5.4, along with guidance found in the corresponding	Resolved. However, it is hoped that engineers will take into consideration the issues raised in Maranian and Dhalwala (2019).

				Commentary sections, and Commentary B3.2.	
A5.2.c #2 (b)	**240**	Add: "CVN of 40 ft lb at 70 degrees F is based upon the assumption that the lowest ambient temperature is 50 degrees. "	Refer to Blodgett (1998), Burdekin (1999), Tsai et al (2001), Miller (1993) It is important to understand lowest ambient temperature can have a significant effect.	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.2.c #2 (b)	**240**	Add: "CVN of 40ft lbs. at 70 degrees may not be adequate for larger thicker members due to size effects."	Refer to Blodgett (1998), Burdekin (1999), Tsai et al (2001), Miller (1993) Procedures need to be established to address required fracture toughness to account for size effects.	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.4.c (b)	**375**	Add: "Where chemical properties on steel are unknown, carry out chemical tests on demand critical components to establish chemical properties including alloying components such as manganese and non-metallic components such as Sulphur. Also establish Carbon Equivalent and Carbon Content"	Refer to Wang (2016) Carbon content can affect the DBTT and therefore fracture performance	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.4.c (d)	**388**	Add: "Where chemical properties on steel are unknown, carry out chemical tests on demand critical components to establish chemical properties including alloying components such as manganese and non-metallic components such as Sulphur. Also establish Carbon Equivalent. Also establish Carbon Equivalent and Carbon Content "	Refer to Wang (2016) Carbon content can affect the DBTT and therefore fracture performance	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.

A5.4.c (e)	**398**	Clarify which hardness test to be used and pertinent ASTM. Add: "CVNs to be taken in the weld, heat affected zone and base metal with the notch orientated perpendicular to the direction of the axial stress. "	Refer to Vickers, Brinell , Rockwell).	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.4.c	**399**	Add; "(f) Where significant through thickness demands occur, test for the potential for laminar tearing. Testing for lamellar tearing may be carried out using the Watanabe test or similar appropriate methods. Also establish toughness variation across thickness of the material.	Refer to Farrar and Dolby (1972) and Farrar (1975) Low toughness in the middle third of the thickness may govern fracture performance since it is also subjected to highest thru thickness triaxiality".	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.4.c	**399**	Add: "(g) Where significant strain rates can occur (such as the Southern California Basin), tensile tests are to be carried out simulating strain rates."	Refer to Maranian and Dhalwala (2019) Mazzolani (2000).	The issue raised by this comment may be considered for further development in the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
A5.4.c	**399**	A section should be added addressing repairs to damage/defects found during inspection and testing. Reference should be made to AWS D1.7. Repairs should also include the Weld Overlay Repair method.	(Anderson et Al (2000) and Simon et al 1999). Weld overlays provide significant performance improvement of the joint by minimizing fracture. AWS D1.7	There is not sufficient test data to support the use of weld overlays as a retrofit solution. Repair is outside the scope of AISC 342.	Unresolved. The response did not address the first item in the comments regarding repairs to damage/defects. Regarding the Weld Overlay Repair Method, see the response to Item D5.
B2.3a	**720**	Add: "Deformation Controlled actions should account for potential variability of material strengths affecting the actions."	For example, whether or not panel zones yield in a steel moment frame connection can significantly affect its performance. A beam with upper bound strength	AISC 342 is following ASCE 41 strategy of accounting for material variability by considering expected and lower-bound strengths.	Unresolved. By doing so, this may result in not capturing all potential forms of joint performance including those which may result in adverse behavior..

			connected to a column with a lower bound strength can cause yielding in the panel zone whereas the opposite may not.		
B2.3a	**720**	Add: "The effects of uncontrolled local buckling shall be accounted for	Bertero and Popov (1967) It should be clarified how uncontrolled actions are to be accounted for. For example, uncontrolled local buckling of flanges and web of steel moment frame connections with the potential to fracture due to low cycle fatigue. Brittle fracture due to pulse effects can also cause joint fracture and result in instability.	These effects are accounted for in the acceptance criteria and in the determination of the strengths.	Resolved. However, in that acceptance criteria may include for uncontrolled local buckling, it should be recognized that this may result in unpredictable behavior. Further development/investigation is strongly recommended.
B2.3b	**725**	Add: "Upper bound strength of materials shall be used where it can be shown that the upper bound strength is detrimental to other components. An example is upper bound strength of girders affecting columns with lower bound strengths in moment frames causing yielding in the column rather than the girder".	It should be noted that to the best of my knowledge, no beam to column moment connections caused the column to yield and not the beam. Therefore, we do not know if the connections work or not should column yielding occur first.	AISC 342 is following ASCE 41 strategy of accounting for material variability by considering expected and lower-bound strengths.	Unresolved. The potential for column yielding before beam yielding remains essentially untested and thus performance is unknown. Further development/ investigation including testing is strongly recommended.
B3.2	**761**	Add "The requirements of Table B3.1 shall be considered as a minimum. Additional requirements may be required to address size effects, restraint to weld shrinkage, lamellar tearing, existing weld defects, etc."	Refer to Dong and Zhang(1998,Burdekin (1999), Farrar (1975), FEMA 351, Maranian (2009), Masabuchi (1980).	The requirements given in the provisions are intended to be minimum requirements. The other issues raised here will be considered for addition in the commentary for the next version of AISC 342.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.
C1	**After 786**	Add: "For Deformation Controlled Actions, where biaxial or triaxial stresses occur in components/ joints	It should be recognized that certain stress/strain conditions result in cause triaxiality and plane strain	Issues raised by this comment will be considered in the next cycle.	Resolved. The writers strongly recommend the issues raised be considered for the

		these require to be checked for ductility by accepted procedures such as von Mises criterion at a minimum. Design/assessment should account for size and distribution of the yield zone, triaxiality, shear stresses and variation of flexural stresses. Use of non-linear continuum mechanics analysis is preferred and will provide more reliable results . Single cycle damage due to pulse effects should also be assessed."	conditions that do not permit shear flow and significantly reduce ductility resulting in increase of the incidence of brittle fractures. Please note, we understand this to be consistent with the intent of AISC Steel Construction Manual statements in "Fatigue and Fracture Control" p.2-38. Regarding triaxial stresses, refer to Blodgett (1998), Dowling (1999) and others. Regarding single cycle damage, refer to partial discussion in FEMA 440 and by others This is applicable to all lateral resisting systems including collectors and chords.		next version of AISC 342. Further development/investigation is also strongly recommended.
C1	**After 786**	Add: "For Force Controlled Actions, where biaxial or triaxial stresses occur in components/ joints these require to be checked for strength by accepted procedures such as von Mises criterion. Assessments should account for shear stresses and variation of flexural stresses. Single cycle high stresses and resulting fracture due to pulse effects should be evaluated "	It should be recognized that certain stress conditions can cause principal stresses that exceed material capacity. Please note, we understand this to be consistent with the intent of AISC Steel Construction Manual statements in "Fatigue and Fracture Control " p.2-38. Regarding triaxial stresses, refer to Blodgett (1998), Dowling (1999). Regarding variation of stresses, refer to Richard et al (1995). Regarding single cycle damage, refer to partial discussion in FEMA 440 and by others.	Issues raised by this comment will be considered in the next cycle.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.

			This is applicable to all lateral resisting systems including collectors and chords.		
C1	**After 786**	Add "Where significant strain rates can occur due to thrust faulting which can result in significant increase in vertical and horizontal accelerations and result in high strain rates , account for change in nil ductility regarding fracture toughness"	Reference Barsom and Rolphe (1999), Maranian and Dhalwala (2019), Mazzolani (2000) . Thrust fault earthquakes occur in Southern California that can cause significant vertical and horizontal accelerations and result in high strain rates that can appreciably effect fracture toughness due to the phenomena causing shift in the nil ductility and shift of the DBTT curve thus reducing fracture toughness. Also, note the following regarding limitation of current state of the art: a) Southern California specific ASCE 7 seismic loads do not adequately consider design for seismic motions measured and return periods observed during several previous Southern California earthquakes since 1857. b) Tests and second order analyses for plastic zone performance subjected to out of plane drifts. c) Fracture tests and analyses for plastic zone performance subjected to out of plane drifts. d) Fracture tests and analyses for plastic zone performance subjected to high strain rates. e) Single cycle damage tests, analyses and assessment	Issues raised by this comment will be considered in the next cycle.	Resolved. The writers strongly recommend the issues raised be considered for the next version of AISC 342. Further development/investigation is also strongly recommended.

			considering effect of single cycle damage on steel frame performance. f) Understanding limitations of tests and analyses. g) This is applicable to all lateral resisting systems including collectors and chords.		
C5	**Table C5.1**	Beam to weak axis columns with moment connections need also to be addressed.	Many buildings have these.	AISC 342 directs the user to use strong-axis parameters for weak-axis columns. (See description of WUF in Table C5.1.) There is insufficient data to provide separate classifications of strong-column and weak-column connections.	Unresolved. There are many buildings that include weak axis connections, Therefore, this issue should be addressed.
C5	**Table C5.1**	Most connections are likely to require replacement of the existing welds due to low toughness. This results in the potential for fracture during replacement/ repair A more effective method is to use the Weld Overlay method	(Brandow and Maranian) (Anderson et al (2000), Simon et al (1999)).	There is not sufficient test data to support the use of weld overlays as a retrofit solution. Repair is outside the scope of AISC 342.	Resolved. However, the writers strongly recommend recommendations be provided in the commentary or direction to applicable repair documents be provided. Regarding Weld Overlays, see the response to D5.
D5		Recommend, use of keepers and collar brackets for collapse prevention. Recommend use of weld overlays for the repair and/or enhancement to minimize potential of fractures. These may be considered as additional requirements to	Despite the good intent of this document, due to the substantial unknowns and potential issues regarding collapse prevention, in our opinion, there remains insufficient confidence in achieving measures to address all potential issues. Thus, the possibility of localized partial	AISC 342 provides acceptance criteria limits for collapse prevention, which avoids the need for keeper and collar brackets. Furthermore, such retrofits are outside of the scope of 342 and left to the user.	Resolved. However, the writers strongly recommend that further development/investigation takes place. Despite the good intent of AISC 342, in our opinion, the level of confidence in achieving satisfactory retrofit/repair solutions appears not adequate due to the significant

		adding new lateral resisting system(s)	collapse, occurring as a result fractures at joints, even with the addition of new lateral resisting systems, remains significant and below normal acceptable confidence levels. Although the document has included a thorough and impressive array of formula, based upon known steel research directed towards their application with ASCE 41, it lacks sufficient use of fracture mechanics and thus the ability to assess the potential for fractures. This does not appear to be consistent with the intent of AISC Steel Construction Manual statements in "Fatigue and Fracture Control " p.2-33. To address the significant unknowns occurring from all potential issues, there may be many solutions that could provide a means of reducing the potential of localized partial collapse. One method is providing keepers or collar brackets immediately below seismic force resisting connections and other connections that could potentially fracture and lead to partial collapse during a seismic event. Furthermore, the weld overlay method, previously mentioned, has been shown to minimize the potential for fractures.	There is not sufficient test data to support the use of weld overlays as a retrofit solution.	unknowns. Also, refer to Maranian and Dhalwals (2019). Regarding Weld Overlays: With all due respect to the Committee, significant testing on weld overlays was carried out. In addition to beam/column tests by Dr. Anderson, the late Dr. Simon carried out numerous tests including drop weight, high-cycle bend tests, etc.. in the late 1990s. The non-proprietary method was successfully used on repairs of several buildings. Further development/testing to justify the findings by Anderson et al (2000) and Simon et al (1999) is strongly encouraged.

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