

Title	FABIG Technical Note 3: Use of Ultimate Strength Techniques for Fire Resistant Design of Offshore Structures
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Scope	<p>Introduction</p> <p>Offshore structures are designed elastically for normal operating and deadweight loads. They may be also designed by a load factor method for the serviceability limit condition which takes account of the deflections found, although these are always expected to be in the elastic range. Other load conditions may also be considered as well as the in-place case, e.g. transportation, to check that no permanent deformations will occur.</p> <p>For accidental loads, however, permanent deformations may be allowed providing that the behaviour of structures does not contravene the acceptance criteria. Performance standards are set for structures in terms of their functionality, reliability, availability, survivability, interactions between systems and maintenance and inspection as they influence the systems reliability and availability. The ultimate strength may be exceeded, for example, after a structure has fulfilled its survivability function for the necessary period of time in an accident.</p> <p>A structure subjected to a fire progressively loses its strength until a global mechanism or a rupture develops when the structure collapses and becomes unusable.</p> <p>Present advanced numerical non-linear methods in structural engineering make an ultimate strength analysis possible. In an ultimate strength analysis, the applied loads are increased from zero to some pre-determined level, and the behaviour of the structure is monitored for each loading increment. As such an analysis predicts progressive failure of members, it is termed progressive collapse analysis.</p> <p>The Interim Guidance Notes (IGN) for the Design and Protection of Topside Structures against Explosions and Fire [1] makes only brief reference to progressive collapse in Section 3.5. In the three years following the publication of this document a significant amount of work has been conducted, developing a greater understanding in the field of progressive collapse.</p> <p>The objective of an analysis of progressive collapse induced by fire is to determine the failure or the time to failure of the structure as a result of the failure of its members due to fire loading. This deterioration in the load carrying capacity of members, and the structure as a whole, can lead ultimately to structural collapse under dead and operational loading.</p> <p>This Technical Note has been prepared to focus on the subject of progressive collapse and supplements Sections 3.5, 4.4 and 4.6 of the IGN, and also Sections 3, 7 and 8 of Technical Note 1 describing the "Fire Resistant Design of Offshore Topside Structures". Various numerical systems, as referenced in [2], [3], [4], [5] and [9], have been applied to carry out progressive collapse analysis. In order to provide guidance for selection and use of a suitable progressive collapse analysis system and progressive collapse modelling, this document introduces the basic theory behind progressive collapse and presents various methods for performing a progressive collapse analysis. It also gives practical examples of application of progressive collapse techniques.</p> <p>The document is set out in a logical manner and considers in turn the setting of performance standards to meet the present goal setting approach to safety on offshore installations, the thermal response of structures and components, the</p>

	strength response of structures and components, combined effects and finally examples describing various approaches.
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