Title	Research report: 484 response spectra for explosion Resistant design and assessment
Publisher/author	Hse
Publication date	2006
Executive summary	This report describes a project to examine the explosion test results obtained at Spadeadam in the 1990's from the point of view of structural response. BP has supplied the FLACS simulated pressure traces corresponding to the experimental results obtained at Spadeadam during the 1990's. The technical reviews by the hse were performed by Roland Martland. **Objective** The main objective of the project was to derive static design pressures for sizing main structures and barriers. **Motivation** Structural engineers are presented with complex simulated or experimental pressure traces and are expected to design efficient structures to resist these loads. It is usually desirable to allow significant local plastic deformation in order to arrive at an efficient design. This often results in the need for a non-linear, dynamic design approach which may be expensive and can be prone to error. The response spectrum approach brings the explosion response checks within the framework of a conventional design or modification project. The information needed to apply the method is an estimate of the natural period of vibration of the target structure and its allowable ductility. The load is represented by the effective pressure 'Pe' and the load duration 'td'. Generation of response spectra for the experimental and simulated results has given a more robust measure of the conservatism or otherwise of the simulation traces than simple comparison of peak pressures would yield. The response spectrum approach has been in use for decades in the earthquake response context and was in fact pioneered in the second world war to calculate ground motion effects and structural response from explosions. **The use of response spectra** The structural element to be assessed may be a panel, a deck, module or a whole topside if they can be idealised as a one degree of system oscillator. This process will be familiar to designers who use the Biggs response method and is in routine use. The next stage is to assess the allowable ductility for the structural element. The allowable ductility of a structural element is a measure of the amount of deformation the element can sustain before rupture or when its performance standards cease to be satisfied. This is usually expressed as a multiple 'μ' of the effective elastic yield displacement.
Table of contents	