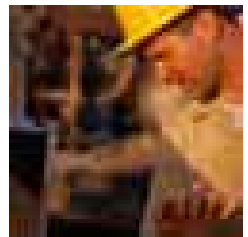


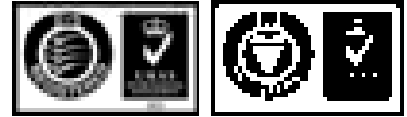
# *Staffing assessment*



# *Capability statement*

# Entec

*Entec is one of the UK's largest environmental and engineering consultancies. Our technical and business skills are dedicated to delivering strategic, technical and engineering solutions which bring commercial benefit to customers at home and overseas. This know-how is based on over 60 years' consulting experience in the public and private sectors.*



Entec operates a Quality Management System in accordance with the latest requirements of the international standard BS EN ISO 9001 and an Environmental Management System compliant with BS EN ISO 14001. Both are audited by BSI Management Systems.



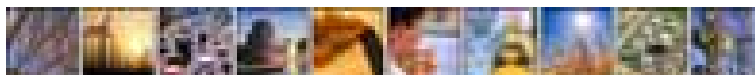
## *History of the staffing assessment methodology*



In order to be able to demonstrate adequate management of health and safety it is important to conduct structured and effective assessments of staffing levels and associated technical and organisational arrangements. This is especially the case given the current business climate where focus on cost minimisation has resulted in 'downsizing' and staff reductions for many organisations.

To assist organisations in making this demonstration, Entec has developed the Staffing Assessment Methodology on behalf of the Health and Safety Executive (HSE). This was published in 2001 as [Contract Research Report](http://www.hse.gov.uk/research/crr_pdf/2001/crr01348.pdf) ([http://www.hse.gov.uk/research/crr\\_pdf/2001/crr01348.pdf](http://www.hse.gov.uk/research/crr_pdf/2001/crr01348.pdf)) 348/2001.

Since its development, Entec has assisted a number of clients in applying the methodology (see project experience pages 7-13). Entec has also written a user guide for the Energy Institute (EI) that sets out best practice for practical application of the methodology, based on lessons learned from its use. This was published in 2004, and is available from the EI website [<http://www.energyinst.org.uk/humanfactors/staffing>]. The user guide also expands on the methodology to better address automated plant and equipment.



# Staffing assessment

## Using the Methodology

The staffing assessment is used to assess the adequacy of staffing arrangements for avoiding and/or responding to major accidents. These are considered to be the worst case for staffing arrangements because they often result in high workload, stress, and reliance on communications. They also rely on timely and effective response. The methodology does not specify minimum or optimum numbers of staff, but will highlight areas of weakness in the staffing levels or associated arrangements so that improvement can be prioritised.

The methodology is concerned with how staffing arrangements affect the reliability and timeliness of detecting incidents, diagnosing them, and recovering to a safe state. If a site finds that its staffing arrangements 'fail' the assessment, it is not necessarily the case that that staff numbers must be increased. Other options may be available, such as improved automation or developing formal arrangements to ensure support from other functions within the business when required.

The overall process is illustrated in the following page. It is conducted in a similar fashion to a HAZOP study. Facilitated workshops, attended by representatives from operating teams and others who may have a role in managing hazardous situations, use the method to structure discussions regarding emergency scenarios and organisational factors. The method provides two sets of tools:

- Physical Assessment decision trees - covering the physical ability to manage hazardous situations in terms of supervision, information provision, the work environment and communications;
- Organisation Assessment anchored scale 'Ladders' - covering organisational and workload factors, benchmarked against industry best practice.



## Managing organisational change

HSE has identified organisational change as the number one human factors issue for health and safety in UK hazardous industries. There is a particular concern that the risk of change is not being managed with sufficient rigour. HSE has published an information sheet on the subject [<http://www.hse.gov.uk/pubns/chis7.pdf>] that makes specific reference to the staffing assessment methodology.

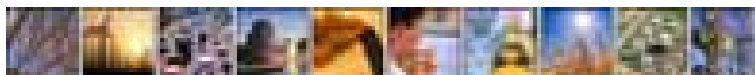
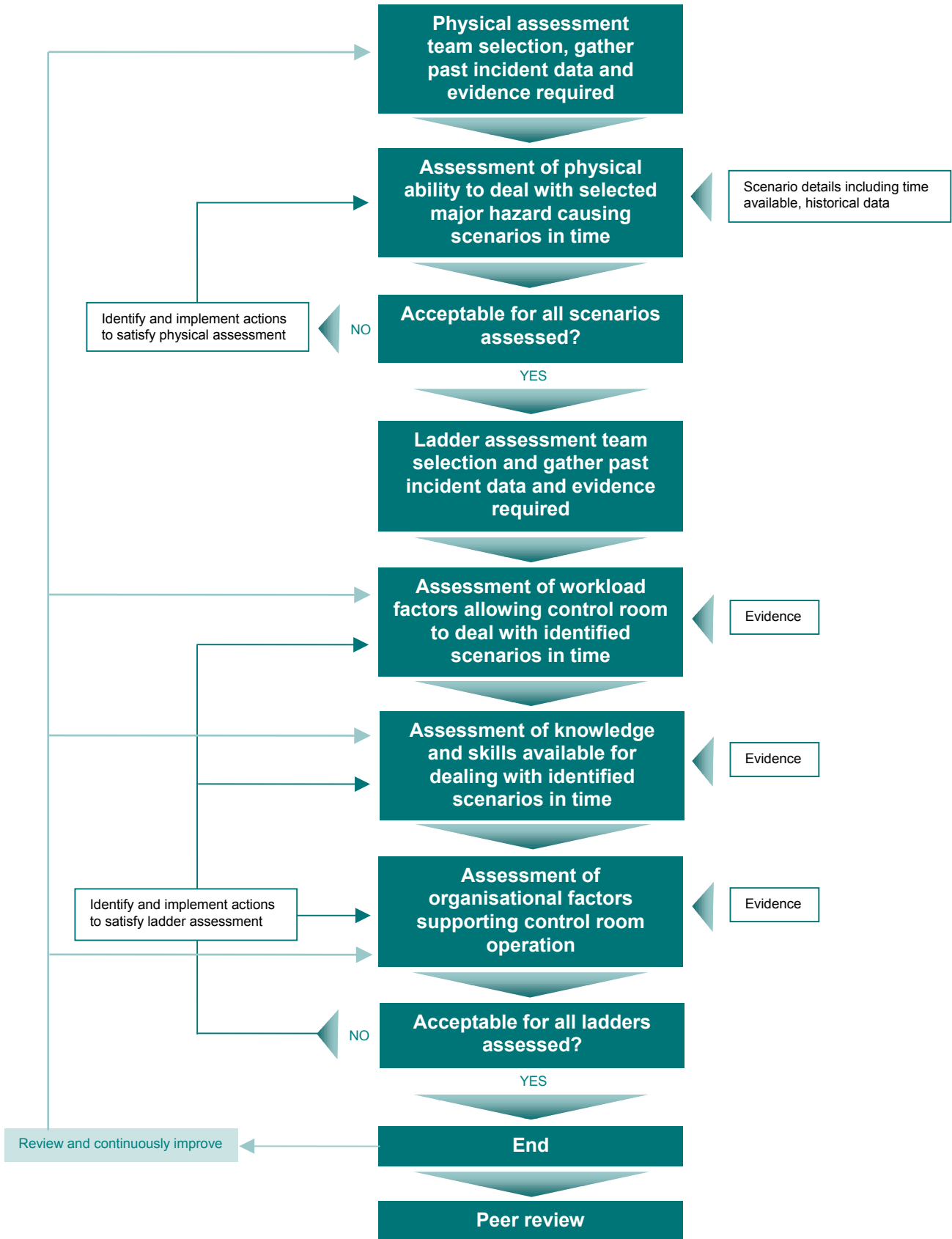
Although the methodology does not remove the need for a robust system for managing organisational change, it can have an important role in identifying potential hazards and specifying necessary controls. In this case the existing arrangements are assessed as a baseline, so that the impact of change can be evaluated. This highlights the elements of the change management plan necessary to ensure risks are reduced as a consequence. In many cases this is achieved by using improved technology to assist the process operators.

The method developed for the HSE includes a high amount of workforce involvement to ensure the assessment is based on what really happens on the plant, and to gain acceptance of the subsequent results.

The staffing assessment work is part of Entec's safety management and safety culture work and is one of the human factors techniques regularly employed in work for industrial clients.



# Staffing assessment



### Services

Entec can carry out a range of services associated with staffing assessments, including:

- Managing, leading and recording the study including the workshop sessions and reporting;
- Providing a workshop facilitator and or technical scribe;
- Training in Staffing Assessment and other Human Factor Techniques;

Other related services including:

- Carrying out Human Factors Assessments to identify and evaluate the causes of potential human errors and associated risks, and to develop strategies for their prevention;
- Applying ergonomic approaches to procedure and competence development;
- Carrying out assessment of safety culture and individuals' safety awareness, followed by improvements through workforce involvement via management leadership.



### Case studies

*The following pages demonstrate Entec's capabilities in the area of staffing assessment, using case study examples. ►*



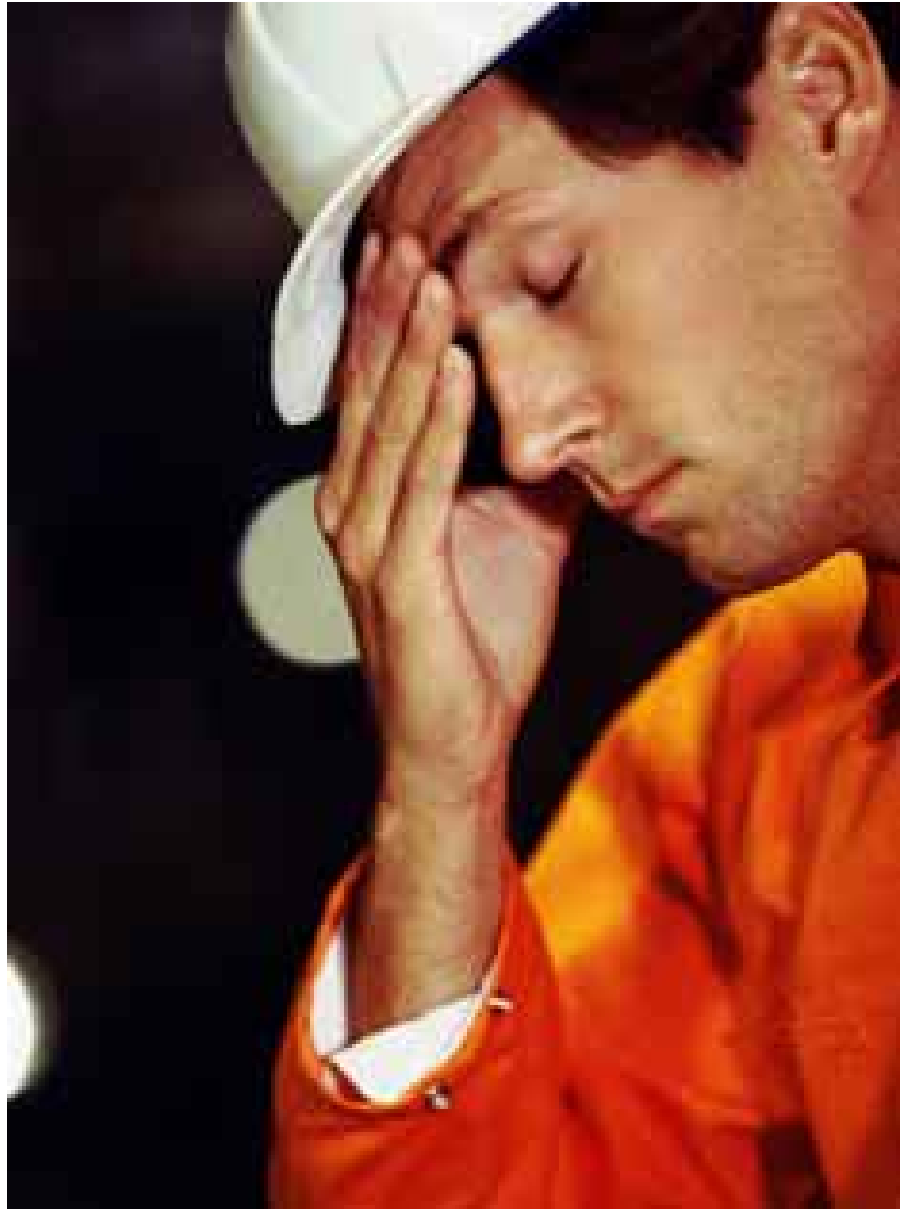
## **Assessing the Safety of Staffing Arrangements for Process Operations in the Chemical and Allied Industries** Health & Safety Executive

This study has been completed on behalf of the Hazardous Installations Directorate (HID) of the Health and Safety Executive, who have observed that a number of chemical sites are taking steps to reduce staffing levels in their operating teams. There is a concern that such reductions could impact the ability of a site to control abnormal and emergency conditions, and may also have a negative effect on staff performance through an impact on workload, fatigue, etc.

A method has been developed that emphasises when too few staff are being used to control a process. It is not designed to calculate a minimum or optimum number of staff, however, if a site finds its staffing arrangements 'fail' the assessment, it is not necessarily the case that staff numbers must be increased as other options may be available. The method also allows duty holders to benchmark how they manage staffing arrangements.

The method has been trialed and from the experience and comments of those participating, it is judged that the method brings staffing issues into the open, is practical, useable and intelligible to duty holders and inspectors, and is robust and resistant to manipulation and massaging of its output.

This work was funded by the Health & Safety Executive with additional support from the companies involved in the case studies. The research and results are published in the Contract Research Report: HSE CRR 348/2001.



*Systematic method to address safety issues  
associated with staffing arrangements*



## **Fuels Area Operational Staffing Arrangement Assessment Confidential Client**

A major oil refinery operating in the UK was in the process of relocating its control centres from local operation to a central control room. The refinery realised that while implementing these changes, it could gain greater benefit from the relocation if the staffing arrangements were assessed in conjunction with the programme. This study provided a pilot assessment of the safety of the proposed arrangements using a method that was justifiable to the Health & Safety Executive (HSE).

Entec has developed an assessment method on behalf of the Hazardous Installations Directorate (HID) of the HSE. HID had observed that a number of chemical sites were reducing the staffing levels of their operations teams. Although sites carry out risk assessments on aspects of their staffing arrangements through task analysis and other existing techniques, problem areas can be overlooked. The method developed is concerned with how staffing arrangements affect the reliability and timeliness of detecting, diagnosing, and recovering incidents to a safe state.

Entec provided a Facilitator to lead the sessions as well as a Technical Secretary to record session minutes and gather data. Entec worked with the site to identify suitable incident scenarios that could be discussed using the current staffing arrangements and then with the proposed arrangements. Through this pilot study, discussion of the scenarios highlighted potential improvements to safety as well as raising awareness of current and proposed future staffing arrangements among operators.

Several measures were highlighted by the study which when implemented will improve safety by improving procedural control and communication amongst operators. Another benefit of the method is that it facilitates an increase in communication between the site management and operations teams.

*Pilot study assessment  
of the safety of  
process operation  
staffing arrangements  
at a major oil refinery*



## Control Room Staffing Assessment Study BP (Grangemouth)

The purpose of the study was to assess the safety of the current staffing arrangements used to operate the utilities plant and then to assess the proposed future staffing arrangements.

The method used was developed by Entec during research sponsored by the Health and Safety Executive and is fully described in CRR 348/2001, 'Assessing the safety of staffing arrangements for process operations in the chemical and allied industries' (Entec 2001).

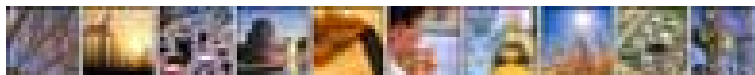
The proposed changes assessed encompassed:

- Plant - addition of steam and power plant;
- Control Room Layout - reallocation of control screens and extensions to the plant areas of responsibility;
- Control Room Operation - changes to control room operations;
- Field Operation - reallocation of field duties for existing operators.

The study assessed the baseline and future staffing arrangements. It took place over a three-month period and involved operators across all shifts from the utilities plus support staff.

In evaluating technical factors the focus of attention is whether the design of the process control equipment (e.g. control room) and support equipment (such as mobile communication equipment) allow incidents to be detected, diagnosed and responded to in time. It is the inherent safety of the design and layout of controls and equipment that is in question. Concerns over whether operators have the training or authority to carry out tasks were also examined. The study assessed the management and cultural factors that influence behaviour and form an essential part of the assessment process. Several improvement actions were identified, these are being implemented.

The study identified actions and recommendations for current and future arrangements from the physical and ladder phases of assessment plus how they relate to the proposed changes.



## Chlorine Plant Process Operation Safe Staffing Arrangements Assessment Associated Octel



The purpose of the study was to assess the safety of the current staffing arrangements used to operate the chlorine plant and then to assess the proposed future staffing arrangements.

The method used was developed by Entec during research sponsored by the Health and Safety Executive and is fully described in CRR 348/2001, 'Assessing the safety of staffing arrangements for process operations in the chemical and allied industries' (Entec 2001). Entec provided a facilitator to chair and direct the study.

The proposed changes assessed encompassed personnel changes and work load changes- reduction in the shift team from one supervisor plus five operators covering three specific areas of operations (clusters), to a team leader plus three operators covering two refined clusters of operations.

The study assessed the baseline and future staffing arrangements. It took place over a three-month period and involved operators across all shifts from the chlorine plus support staff.

In evaluating technical factors the focus of attention is whether the design of the process control equipment (e.g. control room) and support equipment (such as mobile communication equipment) allow incidents to be detected, diagnosed and responded to in time. It is the inherent safety of the design and layout of controls and equipment that is in question. Concerns over whether operators have the training or authority to carry out tasks were also examined. The study assessed the management and cultural factors that influence behaviour and form an essential part of the assessment process. Several improvement actions were identified.

The study identified actions and recommendations for current and future arrangements from the physical and ladder phases of assessment plus how they relate to the proposed changes.

Following a review of the benefits derived from the above study Octel contracted Entec to facilitate similar studies on:

- The tetra ethyl lead plant to assess the current staffing arrangements following recent changes made to staffing levels;
- The boiler house, effluent treatment and utilities plants to assess proposed changes to the staffing levels, changes to workload and consolidation of control rooms (from two to one).



## Refinery Staffing Assessment TotalFinaElf



*Staffing assessment  
for refinery site  
leads to efficiency  
improvements with  
no detrimental  
safety effects*

Entec has undertaken a major staffing assessment on the TotalFinaElf Refinery at Immingham. The project involved the assessment of manning levels on the refinery before and after some major changes to the control room function had been completed. TotalFinaElf had committed to a major upgrade and the centralisation of control on site. Effectively this meant the integration of two separate control systems into one unit, with the associated restructuring of lines of reporting and shift arrangements.

Entec provided comprehensive facilitation and recording expertise for a full staffing assessment of the proposed change, which comprised a complete set of physical assessments and ladder assessments associated with a number of defined scenarios. Approximately 80 staff from TotalFinaElf assisted with the staffing

assessment which provided an objective evaluation of the baseline safety performance before the change. The assessment then projected a number of scenarios with the new control room and manning levels in place and tested the operational capacity to respond to emergency situations. The output from the workshops was then collated and compiled into a format that enabled the site management and HSE to track and review improvements to refinery operations.

Overall the introduction of a centralised control room will significantly enhance the efficiency of operations on the site and, as a result of implementing the recommendations from the staffing assessment, the site management can also be assured of maintaining a strong safety management record as well.



## **Improving the Management of Change** Akzo Nobel International Coatings

Akzo Nobel aims to identify and apply best practice in its management systems. The company had identified that its existing procedures for management of change were not up to the very high standard that the company aims for, and therefore commissioned Entec to undertake a thorough review of how change is managed at the Felling site. With no single, recognised standard for such systems to refer to, the essence of this study was to work closely with the client in analysing the associated activities in order to develop recommendations for how to improve the effectiveness and efficiency of existing systems.

Entec started by collating a comprehensive overview of existing guidance from various sources regarding management of change. This proved to be an invaluable reference against which to evaluate the existing system. The system's key stakeholders (particularly the people involved in identifying, reviewing, authorising and implementing change) were then interviewed to establish their views regarding the strengths and weaknesses of the existing system, and opportunities for improvement. Finally, a number of workshops were held, at which Entec facilitated site personnel in analysing the way different types of change are managed. From these an underlying generic change process was defined that would form the basis for the improved management of change system. Entec's report explained how the findings from the review could be used to develop an over-arching management system for all types of change, and how this would impact on the way changes to plant and equipment are managed. It also emphasised that, to ensure ownership, it was essential that Akzo Nobel personnel develop the details of the systems.

Entec's knowledge of change management and skill at stakeholder engagement and task analysis has meant that Akzo Nobel has a clear understanding of what is needed to achieve the quality of system required. Also, being an objective third party, Entec was able to focus on the key issues, and take a holistic view of how improvement could be achieved.



*Providing a clear understanding of what's  
required to efficiently manage business change*



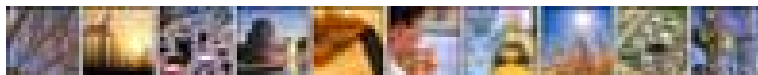


## *Safety assessment*

### *Sample client list*

Akzo Nobel  
Associated Octel  
BP  
Dow Corning  
Health and Safety Executive  
TotalFinaElf

*For a detailed view of Entec's capability in safety culture and management, see our separate capability statement [Safety Management](#).*



*Safety assessment*

# **Entec**

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