| Product/Version or Task: | GSA 8.7.0 |
|---|---|

| Test Plan and Certificate Revision: | 1 |
|---|---|

**Software/Documentation Components Used In Tests:**

```
GSA                        8.7.0.15
AdcData                    50.12.0.15
AdFile                     50.12.0.15
GeoObj                     50.12.0.15
GdSpec                     8.7.0.15
GSA_DES_AISC_360_05        50.12.0.15
GSA_DES_AISC_360_10        50.12.0.15
GSA_DES_AS4100_98          50.12.0.15
GSA_DES_BS5950_1_2000      50.12.0.15
GSA_DES_EC3_2005           50.12.0.15
GSA_DES_HKSUOS_05          50.12.0.15
GSA_DES_IS800_1984         50.12.0.15
GSA_DES_IS800_2007         50.12.0.15
GSA_DES_LRFD3              50.12.0.15
GSA_DES_Rc2D               8.7.0.15
GSA_DES_SANS10162_1_2011   50.12.0.15
GSA_DES_StressCheck        8.7.0.15
Gsa_Export_Cad             8.7.0.15
Gsa_Import_Cad             8.7.0.15
Gsa_Export_dxf             8.7.0.15
Gsa_Import_dxf             8.7.0.15
GsAdc                      8.7.0.15
GsBridge                   8.7.0.15
GsCheck                    8.7.0.15
GsEnvelope                 8.7.0.15
GsExport                   8.7.0.15
GsFile                     50.12.0.15
GsGraph                    8.7.0.15
GsPrivate                  8.7.0.15
GsRaft                     8.7.0.15
GsRelax                    8.7.0.15
GSS                        50.12.0.15
GsTable                    8.7.0.15
GwDat                      50.12.0.15
OaBase                     50.12.0.15
OaMatrix                   1,4,1,16171
OaRaft                     50.12.0.15
OaSect                     50.12.0.15
OaSteelDesUtil             50.12.0.15
OaUtil                     50.12.0.15
OaWin                      50.12.0.15
PDDCal                     50.12.0.15
WaveLoad                   8.7.0.15
```

**Verification**

The six software development outputs listed below shall be verified using a combination of the measures proposed. The Test Plan shall identify which of the options is to be used to verify the software, and, where appropriate, give more detailed descriptions of the methods, data files etc to be used. Any changes that are necessary to existing test regimes shall be detailed.

**1      Requirements**

| Test Plan | Testing |
|---|---|

| Item | Required | Generic Requirement and Additional Task-SpecificDetail | Completed By |
|------|----------|--------------------------------------------------------|--------------|
| 1.1 | Yes | Ensure that the stated system and software requirements are well defined, consistent, feasible and testable. | CK |
| | | **Detail:**Ensure software requirements are adequately described in the Design Scope. | |
| 1.2 | No | Ensure that requirements to specific system items and operations are allocated according to design criteria. | |
| | | **Detail:** | |
| 1.3 | Yes | Ensure that system requirements relating to safety, security and integrity are correct as determined by suitably rigorous methods. | CK |
| | | **Detail:**Ensure licensing requirements are stated in the Design Scope. | |
| 1.4 | No | **E**nsure that changes to requirements are controlled, meet the original system criteria, are effectively incorporated and that any adverse effects are identified and communicated. | |
| | | **Detail:** | |

## 2  Design

| Test Plan | | | Testing Completed By |
|-----------|---|---|----------------------|
| **Item** | **Required** | **Generic Requirement and Additional Task-Specific Detail** | |
| 2.1 | Yes | Ensure the design has been verified and is correct, safe, consistent with and traceable to requirements. | CK |
| | | **Detail:**The design shall be reviewed for consistency with requirements. | |
| 2.2 | Yes | Ensure the design conforms with engineering standards, established codes of practice and regulatory requirements. | CK |
| | | **Detail:**(as 2.1) | |
| 2.3 | Yes | Ensure the design implements the correct sequence of events within given efficiency, time and performance criteria. | CK |
| | | **Detail:**Ensure the software is designed to function efficiently. | |
| 2.4 | Yes | Ensure the design can be derived from the requirements. | CK |
| | | **Detail:**Ensure that included tasks are documented and fixed NCRs cross reference code changes. | |
| 2.5 | Yes | Ensure the design implements safety, security and other requirements correctly as determined by suitably rigorous verification methods. | CK |
| | | **Detail:**Ensure that security system (ref. 1.3) is functioning correctly. | |

## 3  Code

| Test Plan | | | Testing Completed By |
|-----------|---|---|----------------------|
| **Item** | **Required** | **Generic Requirement and Additional Task-Specific Detail** | |
| 3.1 | Yes | Ensure the code is documented | CK |
| | | **Detail:**Satisfy that coding standards are met. | |

| Item | Required | Generic Requirement and Additional Task-Specific Detail | Testing Completed By |
|------|----------|---------------------------------------------------------|----------------------|
| **3.2** | Yes | Ensure the code is under configuration management, it is traceable to design specifications and requirements, it is testable, understandable and maintainable and conforms to relevant programming standards. | CK |
| | | **Detail:** Satisfy that configuration standards are met. | |
| **3.2.1**[(4)] | Yes | Rebuild code from Oasys configuration management store to ensure its completeness. | CK |
| | | **Detail:** Rebuild code from Oasys configuration management store to ensure its completeness. | |
| **3.3** | Yes | Ensure code modularisation is logical and consistent with design requirements. | CK |
| | | **Detail:** Ensure that logical code modularisation has been applied. | |
| **3.4** | No | Ensure code contains no redundant features and has been tested as thoroughly as practicable. | |
| | | **Detail:** | |

### 4 Integration

| Test Plan | | | Testing Completed By |
|-----------|--|--|----------------------|
| **Item** | **Required** | **Generic Requirement and Additional Task-Specific Detail** | |
| **4.1** | Yes | Ensure full integration of software and hardware components into the system. | CK |
| | | **Detail:** Carry out installation tests. | |

### 5 Documentation

| Test Plan | | | Testing Completed By |
|-----------|--|--|----------------------|
| **Item** | **Required** | **Generic Requirement and Additional Task-Specific Detail** | |
| **5.1** | Yes | Ensure documentation is consistent and complete. | CK |
| | | **Detail:** Ensure that online help/manual, change log and web site are updated. | |
| **5.2** | Yes | Ensure document configuration control is applied. | CK |
| | | **Detail:** Configuration control to be applied to online help files. | |

### 6 Development Outputs

Development outputs should be demonstrated to meet the development input requirements by one or more of the following verification techniques

| Test Plan | | | Testing Completed By |
|-----------|--|--|----------------------|
| **Item** | **Required** | **Generic Requirement and Additional Task-Specific Detail** | |
| **6.1** | Yes | review (for example, walkthrough, inspection or peer review as part of Design Review) | CK |
| | | **Detail:** Outputs should be reviewed at design review. | |
| **6.2** | Yes | tracing software requirements to software components and vice-versa | CK |

|  |  | **Detail:** Associate required functionality with software components.<br>Ensure that NCRs identified in the Release Notes have been addressed. |  |
|---|---|---|---|
| **6.3** | Yes | formal proof of correctness of the development output | CK |
|  |  | **Detail:** Compare results with benchmark. (see 6.4.2 table) |  |
| **6.4.1** | Yes | unit tests of a software component | CK |
|  |  | **Detail:** Perform unit tests on new and modified modules. |  |
| **6.4.2** | Yes | integration tests of an assembly of software | CK |

**Detail:**

Carry out final code integration tests as detailed in the table below.

| **General User Interface Tests**<br>Graphics<br>Context sensitive menus<br>Selection sets<br>Cut and paste<br>Report view options | |
|---|---|
| Comments : | CK |

| **Table Tests**<br>Simple table (e.g. axes)<br>Multi-page, multi-view table (e.g. nodes)<br>Multi-page, multi-module table (e.g. loads)<br>Multi-page, multi-record table (e.g. alignments)<br>Table with results<br>Copy to/paste from spreadsheet<br>Cut/copy/paste in table<br>Table edit options (e.g. find, modify)<br>Table data options (e.g. units, wizards) | |
|---|---|
| Comments :<br>Tests passed | SH |

| **GsRaft Table Tests**<br>Simple table (e.g. soil zones)<br>Multi-page (e.g. soil profiles)<br>Table with results<br>Copy to/paste from spreadsheet<br>Cut/copy/paste in table<br>Table edit options (e.g. find, modify) | |
|---|---|
| Comments : | TL |

| **Pre-processing Tests**<br>Mesh generation | |
|---|---|
| Comments : | CK |

**Post-processing Tests**
Axes
Enveloping
RC slab design
RC member design
Strain energy density
Steel design code checks
Bridge load optimisation

| | |
|---|---|
| Comments | TL (bridge load)<br>RB (steel design)<br>TL (RC2D)<br>SK (RCmem)<br>AH (other) |
| **Design Interface Tests**<br>    RC slab design<br>    RC member design<br>    Steel design | |
| Comments : | TL (RC2D)<br>SK (RCmem)<br>RB (steel design) |
| **GSS Tests**<br>    Static<br>    Static P-delta<br>    Modal dynamic<br>    Modal P-delta dynamic<br>    Ritz<br>    Ritz P-delta<br>    Buckling<br>    Mass | |
| Comments :<br>    Also tested parallel sparse solver.<br>    Test failures checked – no problems identified | SH |
| **GsRelax Tests**<br>    Static<br>    Static with buckling<br>    Static non-linear<br>    Static non-linear with buckling<br>    Miscellaneous | |
| Comments : | TL |
| **GsSpec Tests**<br>    Response spectrum analysis<br>    Harmonic analysis<br>    Periodic load analysis<br>    Time history analysis<br>    Footfall analysis | |
| Comments :<br>    Response spectrum analysis OK | SH (RespSpec)<br>TL (other) |
| **GsRaft Tests**<br>    Soil-structure interaction | |
| Comments : | TL |
| **Bridge Tests**<br>    Influence analysis | |
| Comments : | TL |
| **Analysis Envelope Tests** | |

| | | | |
|---|---|---|---|
| Analysis envelopes | | | |
| | | AH | |
| **Section Tests** | | | |
| Section properties | | | |
| Comments : | | SH | |
| Passed | | | |
| **3rd Party Software Interaction** | | | |
| CAD i/o | | | |
| GsRevit | | | |
| Comments : | | SK /RK | |

**Validation**

| **Test Plan:** |
|---|
| Validation by beta testing within Arup prior to release. |

| **Testing Completed By** | CK |
|---|---|

| **Comments:** |
|---|
| 4.1    See files <GF62 6 Release Installation Test Report (Win32).docx> and <GF62 6 Release Installation Test Report (x64).docx> for installation test details. |

| **Conclusions:** |
|---|
| GSA 8.7.0 has satisfied all verification tests. |

**Test Plan**

| **Task Manager** | Chris Kaethner | **Date** | 1 August 2013 |
|---|---|---|---|
| **Product Director** | Chris Kaethner | **Date** | 1 August 2013 |

**Test Certificate**

| **Task Manager** | Chris Kaethner | **Date** | 14 Feb 2014 |
|---|---|---|---|
| **Accepted For Release (Yes/No)** | Yes | | |
| **Product Director** | Chris Kaethner | **Date** | 14 Feb 2014 |

Notes

| | |
|---|---|
| (1) | Delete as appropriate. |
| (2) | Refer to procedures, data files, instances of GF62.1 Test Report, and testers where appropriate. |
| (3) | Identify operating systems. |
| (4) | 3.2.1 must be performed for code provided by imported UK resources such as Minds Eye Visualisation Services Ltd. |