BDonline
Release 1.0
MASTER TEST PLAN

Version 0.9

Draft

December 2000

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1.   *Test Plan Identifier*
BDonline release 1.0 MTP 0.9
Note, the structure of this document is primarily based on the IEEE 829-1998 Standard for Software
Test Documentation. Additional reference standards include IEEE 1008 (Unit Testing), 1012 & 1059
(Validation & Verification) and 1074 (Software Life Cycle process).

2.   *Introduction*
In order to be competitive in the US Brokerage market, Brown & Donaldson (B&D) feels that it needs
to be able to offer it's existing and future clients the opportunity to trade US equities online. This
project's goal is provide a basic online trading Web site (which can be enhanced in the future) ASAP.
The initial release of the Web site and application will be known as BDonline release 1.

The target audience will initially be for existing B&D clients who would rather place an order via their
computer than using the telephone to their broker and new clients. Once the system is working
successful, B&D intends to start an aggressive marketing campaign to attract new clients for the online
trading Web site.

The anticipated initial production environment for BDonline release 1.0 is a cluster of Intel based
machines running Microsoft Windows 2000, IIS, ASP and SQL Server. B&D's existing infrasture and
knowledge base primarily drove this initial selection. However, once the Web site is operational, this
initial selection of products will be reviewed to determine if they will ultimately provide the kind of
scalability needed for the foreseeable future.

Due to pressing business needs, B&D's traditional development and testing processes have been
customized to allow for faster and more frequent delivery cycles. Specifically, testing will now consist
of the following phases (listed chronologically):
- Unit and integration level – adherence to coding standards and successful communication
  between units
- Code Quality Assurance - acceptance into system level testing by successfully repeating a small
  subset of the tests performed in the code and integration level
- System level – compatibility, performance, usability, functionality etc.
- System Quality Assurance & Acceptance (acceptance into Production)
- Post Implementation

Each testing phase will be described within it's own test plan (included as Appendixes to the Master
Test Plan). While the MTP (this document) may outline the overall strategy and document the aspects
of the testing that are common to all of the phases.

3.   *Test Items*
The scope of this Testing activity will include:
- BDonline release 1.0 Web site application software and supporting infrastructure
- Windows based client platforms

The scope of this testing activity will not include:

- BDonline's documentation e.g.: Requirements & Design Specifications or User, Operations & Installation Guides
- Any other B&D Web sites or applications
- Any Legacy systems that the BDonline application integrates with (with the exception of the interface)
- Supporting operational processes such as postal confirmation of trades or customer service e.g. the telephone wait times that customers have to spent waiting for service

4.   Features and Functions to Test

Testing will consist of several phase (see introduction), each phase may or may not include testing of anyone or more of the following aspects of the BDonline Web site (listed alphabetically):

- Accessibility
- Audit
- Availability
- Coding standards
- Compatibility
- Content
- Functional
- Legal
- Marketing
- Navigation
- Performance
- Reliability
- Scalability
- Security
- Site recognition
- Usability

5.   Features and Functions Not to Test

It is the intent that all of the individual test cases contained in each test plan will be performed. However, if time does not permit, some of the low priority test cases may be dropped.

6.   Approach/Strategy

The philosophy of the testing is risk-based testing, i.e. each test case will be prioritized as, High, Medium, or Low priority and then scheduled accordingly (Highest first). Exceptions to this general rule might include instances where:

- A large number of low priority test cases can be executed using a small amount of resources
- Scheduling conflicts arise e.g. the DBA is on vacation, thereby causing lower priority tests (that do not need her assistance) to be scheduled while she is away
- A lower priority test is a pre-requisite of another higher priority test e.g. an expensive and high priority usability test might necessitate many of the inexpensive low priority navigational tests to have passed

- Due to the lack of comprehensive requirements, navigational and functional tests may be scheduled first, so as to allow the testers the opportunity to gain familiarity with the Web site (thereby also allowing them to developing pseudo requirements).

The testing will use a combination of manual and automated testing, due to the limited duration of the testing; only automated tools that are already familiar to the B&D staff or have a minimum learning curve will be used.

Due to the short period of time allotted for test execution, the Web site's source code will be frozen while being tested. Except for critical fixes that are blocking the testing efforts, changes will not be scheduled while a unit of code is being tested.

Basic metrics will be kept for test effort (i.e. hours), test cases executed, and incidents. Due to the lack of available tools and time, no attempt will be made to collect more sophisticated metrics such as code coverage.

7.   Item Pass/Fail Criteria

The entrance criteria's for each phase of testing must be met before the next phase can commence. Formal approval will be granted by the IS Director.

The IS Director will retain the decision as to whether the total and/or criticality of any or all detected incidents/defects warrant the delay (or rework) of the BDonline release 1.0 Web site.

8.   Suspension Criteria and Resumption Requirements

In general, testing will only stop if the Web site Under Test (**WUT**) becomes unavailable. If testing is suspended due to the Web site becoming unavailable, testing will be resumed once access to the Web site is reestablished.

Certain individual test cases may be suspended, skipped or reduced if prerequisite tests have previously failed e.g. usability testing may be skipped if a significant number of Web page navigational tests fail.

9.   Test Deliverables

The following documents will be generated as a result of these testing activities:
- Master test plan (MTP - this document)
- Individual test plans for each phase of the testing cycle (as an Appendix to the MTP)
- Combination incident/test summary reports for each phase
- Test log for each phase
- Automated test scripts and supporting test data

Note: Under normal testing conditions, a daily incident report would be produced rather than a combined incident/test summary report. A daily incident report would normally be used by the development team to get a "heads up" on any potential defects and allow a Change Control Board (CCB) to decide which enhancements/fixes could be introduced into the test environment during the

current testing cycle. However, due to the short test execution time period a single incident/test summary report will be produced for each of the testing phases.

With the exception of the automated test scripts, all documents will be delivered as Microsoft Office 2000 documents.

10.   Remaining Test Tasks

Upon delivery of the aforementioned test deliverables and the successfully installation of the BDonline application into the production environment, all of the tasks covered by this master test plan will be deemed to have been completed. The only exception being the post-implementation test plan, which will be a continuing effort until the application is replaced or decommissioned.

11.   Test Environments

There are essentially two parts to the BDonline application in production: the client-side, which because the application is going to accessed over the Internet by members of the general public, B&D has little control over. And the server-side which (initially) will be comprised of a single cluster of servers residing at B&D's corporate IS center.

Available Client-side Environments Available

Due to a limited budget and the pressing need complete the testing phase, B&D has decided not to purchase any additional client-side hardware, instead B&D will utilize it's existing set of desktop and laptop machines, which currently consists of the following machine specifications:

- "High-end PC" – B&D's current desktop standard
  Pentium III 677Mhz, 128MB RAM, 8GB HD, 17" Color Screen (default 1024 x 768 – 16 bit color), external stereo speakers and 56.6kps Modem or 100MB Ethernet Internet connection typically running Windows ME or Windows 2000 Professional
- "Mid-range laptop" – B&D's current laptop standard
  Pentium II 333Mhz, 96MB RAM, 4GB HD, 12" Color Screen (default 800 x 600 – 16 bit color), built in stereo speakers and 56.6kps Modem or 10MB Ethernet Internet connection typically running Windows 98 SE or SR2 (with Y2K upgrades)
- "Low-end PC" – B&D's old desktop standard
  Pentium 100Mhz, 32MB RAM, 13GB HD, 15" Color Monitor (default 1024 x 768 – 256 color), external stereo speakers and 14.4/28.8/33.3kps Modems or 10MB Ethernet Internet connection typically running Windows 95 SE or A (with Y2K upgrades)
- "Legacy laptop" – B&D's old laptop standard
  486DX 50Mhz, 8MB RAM, 250MB HD, 8" Mono Screen (default 640 x 480 – 256 color) and 14.4kps Modem typically running Windows 95 SE or A (with Y2K upgrades)

Note: All PC's allowed Windows to manage their O/S swap file and had access to a color printer.

The following Windows based Browsers are readily available for installation on any of the client platforms (listed alphabetically):
- AOL 3.0, 4.0, 5.0 and 6.0
- Home Reader (Audio browser)

- Lynx (Text only browser)
- Microsoft Internet Explorer 3.0, 4.72 SP1a, 5.0 and 5.5
- Mosaic 2.0 (a very old legacy browser)
- Neoplanet 5.0 (Austin Powers build using MS IE 5.0, representative of the many "custom" Browsers that use MS IE as a kernel)
- Netscape Navigator 3.0, 4.5, 4.6, 4.7 & 6.0
- Opera 3.6, 4.0 and 5.0 (a very fast browser, partly because it strictly adheres to the W3C HTML/JavaScript standards)

Browser settings (cache size, # of connections, font selection etc.) where possible were left unchanged i.e. the installation defaults were used for all testing. No optional Plug Ins will be installed.

Available Server-side Environments

In addition to the cluster of servers used for production, two functionally exact replicas of the server-side production environment will be created and maintained. The development team will use one replica for unit and integration testing, while the second replica will be reserved for system testing by the testing team. Prior to a new release being put into production, the Web application will be moved to a staging area on the production system where a final series of acceptance tests can be performed.

While the replica systems will be functionally the same as the production environment e.g. same system software installed in the same order, with the same installation options selected etc. Due to budget constraints, the replicas will be scaled down versions of the production system (e.g. instead of several Web servers, there will only be one) and in the case of the unit/integration replica, the hardware specifications may not be exactly the same (e.g. Pentium II processors instead of dual Pentium IV's).

In addition, several network "file and print" servers will be made available (on a limited basis) for the testing team to use as load generators during performance tests.

Available Testing Tools

The following 3rd party "free" tools were available to scan the Web site and provide feedback:
- Bobby (accessibility, performance & html syntax) – cast.org
- Freeappraisal (performance from 35 different cities) – keynote.com
- Scrubby (meta tag analyzer) – scrubtheweb.com
- Site analysis (search engine ratings) – site-see.com
- Stylet (style sheet validation) – microsoft.com
- Tune up (performance & style checker) & gif lube (gif analyzer) – websitegarage.com
- Websat (usability) – nist.gov
- Web metasearch (search engine ratings) – dogpile.com
- Webstone (performance benchmarking tool) - mindcraft.com
- Windiff (file comparison) – microsoft.com
- W3C validation service (html and css syntax) – w3c.org

In addition the following "commercial" tools were available:
- Aetgweb (pair-wise combinations) from Telcordia/Argreenhouse

- Astra Site Manager (linkage) from Mercury Interactive
- eTester suite (capture/reply, linkage & performance) from RSW – 100 virtual user license
- FrontPage (spell checking) from Microsoft
- Ghost (software configuration) from Symatec
- KeyReadiness (large scale performance testing) from Keynote systems
- LinkBot Enterprise (link checking, HTML compliance and performance estimates) from Watchfire
- Prophecy (large scale performance testing) from Envive
- WebLoad (performance) from Radview – 1000 virtual user license
- Word (readability estimates) from Microsoft

A manual digital stopwatch was also available.

12. Responsibilities
The following people will be responsible for:
- Donald Thump (CEO) – Project sponsor
- Ivan Networkski (IS Director)– Decisions requiring senior management approval
- Mary Catchall (Test Manager) – System and post implementation testing
- Johnny Goodspeed (Development Manager) – Unit and integration testing
- Billy Crosby (QA Manager) – Quality Assurance
- Hans Burger (Office Manager for European branch) - International testing
- Tim Bookerman (Librarian) – Configuration management
- Julie Sold (VP of Marketing) – Final acceptance of the Web site
- Jack Bond (Business Analyst) – Business operational matters
- Sue Court (Legal Counsel) –Legal matters
- Des Umé (VP of HR) – Staffing issues

13.   Staffing and Training Needs
The relevant B&D managers will ensure that the staff assigned to this project are experienced with:
- General development & testing techniques
- B&D's Web site development lifecycle methodology
- All development and automated testing tools that they maybe required to use

14.   Schedule
The following tentative schedule will hopefully be meet:
- Test design (this document) is expected to be completed by the end of this month
- Test execution is expected to last no more than two weeks and to start immediately after the test plans have been approved and the Web application has been hosted
- Producing the Test Incident/Summary report is expected to be completed within 2 business days of completing the test execution phase

A more detailed breakdown is currently being developed in MS project and will be completed before this master test plan is approved.

15.   *Risks and Contingencies*

The following seeks to identify some of the more likely project risks and propose possible contingencies:

- Web site becomes unavailable – Testing will be delayed until this situation is rectified - May need to recruit more staff to do the testing or reduce the number of test cases.
- Web testing software is not available/does not work (e.g. Web site uses cookies and tool can not handle cookies) - This will delay the introduction of automated testing and result in more manual testing - May need to recruit more staff to do the testing or reduce the number of test cases.
- Testing staff shortages/unavailability, many of the test staff are part-time and have other higher priorities, in addition no slack time is allocated for illness or vacation - May need to recruit more staff to do the testing or reduce the number of test cases.
- A large number of defects/incidents makes it functionally impossible to run all of the test cases – As many test cases as possible will be executed, The IS Director in conjunction with other B&D Managers will ultimately make the decision as to whether the number of defects/incidents warrants delaying the implementation of the production version.
- Not enough time to complete all test cases. If time cannot be extended, individual test cases will be skipped, starting with the lowest priority.

16.   *Approvals*

The IS Director must approve this plan.

Appendix

This Appendix is comprised of the following test plans (listed chronologically):

Unit and Integration Level
Code Quality Assurance (acceptance into System testing)
System Level
System Quality Assurance & Acceptance (acceptance into Production)
Post Implementation

Documentation Templates

BDonline
Release 1.0
UNIT & INTEGRATION TEST PLAN

Version 0.9

Draft

December 2000

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Brown & Donaldson

3.   Test Plan Identifier
BDonline release 1.0 UNTP 0.9
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test
Documentation

4.   Introduction
This test plan outlines the standard tests that should be applied to the group of program files (HTML,
ASP, SQL code etc) that are used to build each Web page i.e. the tests listed in this document should
be used as a template when building the test plan for each Web page (A.K.A. Module).

This testing phase will use a number of testing techniques: code reviews and inspections, white-box
testing, "buddy" testing etc to ensure that the code matches the required program specifications. The
decision as to which technique(s) to use for any given unit of code will reside with the team leader
responsible for signing-off on the Module.

5.   Features and Functions to Test

Accessibility
UIAC1 - Low
The Web page should be Bobby Level 1 accessibility compliant

UIAC2 - Low
The colors used on this Web page are friendly to color blind viewers

Availability
N/A

Compatibility
UICO1 - Medium
All on the U.S. general release versions of the following Windows based browsers should accurately
render the Web page (with/without stylesheets enabled) when viewed via 800x600 screen resolution in
full screen mode (e.g., no horizontal scroll bars):
* AOL 6.0
* MS IE 4.0 and 5.5
* Netscape Navigator 4.0 and. 6.0
* Opera 5.0

UICO2 - Medium
The content of the Web page is clearly readable when printed with a:

- 72-dpi black and white printer using Letter sized paper
- 72-dpi color printer using A4 sized paper

UICO3 - Low
The Web page is understandable when heard through an audio-only browser (e.g. Home Reader)

UICO4 - Low
The Web page is understandable when viewed through a text only browser (e.g. Lynx)

Coding standards

Each of the units of code that make up the module being tested (typically a single fully functional Web page) must be coded to all of the following coding standards, any deviations from the standard must be documented and approved

UICS1 - High
The code must pass the following syntax and design requirements:
- B&D's standard naming conventions (see B&D naming conventions document) were followed
- Each unit of code has been inherited or copied from the most appropriate object class or template
- HTML code must be coded to the W3C HTML 4.0 standard and validated via the W3C validation service or with LinkBot's HTML validation option. Any exceptions must be documented and approved
- All client-side scripting must be JavaScript 1.2 compliant (W3C EMCA 2.0 would have been preferred, but in order to be compatible with older browsers 1.2 was chosen)
- No proprietary (Microsoft or Netscape) HTML/JavaScript/CSS/SQL tags/commands are to be used
- All server-side scripting should be coded in VBScript 5.0
- All database calls should be coded with ANSI SQL via a MS SQL Server ODBC connection
- All development/testing source code will be document/commented with standard module headers (thereby making maintenance/debugging easier), especially for server side includes e.g.:
  - Module name
  - Original author
  - Date initially written
  - Language and version
  - B&D Copyright
  - Enhancements/changes log - who/when/why
  Note: For performance and security reasons, the production version (as seen by the user) will not contain this information (with the exception of the copyright, which should be placed in the "Copyright" meta tag)
- Error messages do not describe the internal workings of the program

UICS2 - High
The Web page must be build without using any of the following restricted technologies:
- Client-side Java Applets/Servlets, Java Applications or Active X controls
- Server-side Java Beans (EJB), Java Servlets, Java Server Side Includes (JSSI), Java Applications or Active X controls
- Framesets, including inline or floating framesets
- Java Style Sheets (JSS)
- CGI scripts
- Mailto's (all contact will be via Forms)
- XML vocabularies (this may be reviewed in future release)
- WML
- No client-side Plug-ins (3rd party or B&D developed), unless specifically approved
- Multiple domains

UICS3 - Medium
Each Web page should posses the following visual properties:
- The Web page does not use more than 256 colors (including dithering colors)
- White has been used as the default background color
- Color should not be used as sole means of conveying information
- The Web page should be no wider than 1 screen width i.e. (800-100) 700 pixels
- The Web page should be no longer than 2 screen lengths i.e. (600-100 x 2) 1000 pixels
- Today's date is displayed on the Web page (Tuesday, September 05, 2000 format)
- The B&D copyright is displayed at the bottom of the Web page
- All page component sizes are specified as a % of the page, rather than as an absolute # of pixels

UICS4 - Medium
Each graphic used should meet the following specifications:
- All image files should use a DPI of 72 (view monitors are currently able to display higher resolutions)
- .jpg's are to be used for photographic images and should be compressed to the smallest size possible while maintaining a clear picture, use of the progressive feature should be avoided (they are not supported by 2.x browsers and are problematic in some 3.x versions) except for exceptionally large files – which require separate approval.
- .gif's are to be used for non-photographic images (currently do not use .png's)
- Where possible all .gif files should be composed of 8x8 pixel blocks (gif's are downloaded in blocks of 8x8 pixels)
- No .gif file should use more than 16 colors (including differing colors) the main colors should be selected from the B&D corporate palette and "saved as" with as few colors as possible
- .gif's may be saved with Transparency but should not be interlaced
- Sponsor logo images must be 125x125 pixels in size (in advertising lingo this is refereed to as an industry standard "Square Button") and use no more than 16 colors
- All graphics must be assigned an <ALT> tag, white space and lines should use an ALT tag of " "

- Maximum of 1 animated image per page (under special circumstances, more than one animation is permitted if they are visually located next to each other, thereby appearing to the viewer to be a single animated area)
- If this image is animated, it links to an approved business partner or it's directly related to a B&D's marketing campaign
- The WIDTH and HEIGHT (expressed as page % and not absolute pixel sizes) tags have been specified for this image
- Any image maps used are client side (as opposed to server side)
- All colors used by not photographic images are "browser-safe"
- All graphic files should be named appropriately e.g. warning.gif not pic234.gif

UICS5 - Medium
The text used to display the content of the Web page must meet the following specifications:
- The text must use one of the styles specified in the B&D corporate Cascading Style Sheet (named bd.css)
- The Web page must not dynamically alter any of the styles defined in the style sheet nor the browsers default font sizes
- Any style added to the bd.css style sheet must meet the following guidelines:
  - Unless otherwise approved, the style will use the following fonts/font family verdana, arial and sans-serif specified in this exact order
  - The specified font(s) must be proportional fonts, no fixed-width fonts are to be used
  - No embedded fonts are to be used
  - Unless otherwise approved, only small, medium and large font sizes are to be used to display text e.g. no tiny font sizes are to be used i.e. x-small or xx-small
  - No obscure fonts are to be used e.g. Haettenschweiler
  - Only dark colors are used for the text on the Web page
- The bd.css style sheet must be and defined as an external CSS file and be W3C CSS level 1 compliant– this will be validated using the W#3C validation service and/or StyleT
- If symbol fonts are used, they are properly mapped to the "private use area" of the developer's Unicode
- No more than 4 colors have been used for text on a single Web page

UICS6 - Medium
Any Form used on the Web page meets the following requirements:
- All data entry fields have the HTML "SIZE" attribute set correctly (SIZE is used to specify the width of the field)
- All data entry fields have the HTML MAXLENGTH attribute set correctly (MAXLENGTH is used to specify the maximum number of characters a user can enter)
- If radio controls are used, a default is always selected
- If a drop-down data entry field (control) is used, the options are sorted appropriately and the field is wide enough to display all of the options
- The browser places the cursor on the most appropriate field/control when the Form is first viewed
- Using the browsers Tab key allows the client to tab through the input fields on the Form in a top to bottom, left to right order

- The data is sent back to the Web server using the HTTP POST command (as opposed to the GET command which may truncate the data)
- All data entry fields are checked for invalid data and an appropriate error message is displayed if the data is found to be invalid
- All validations are performed (and error messages displayed) in a top-down, left-to-right fashion
- All required fields are checked on the client-side
- Where possible, all field co-dependencies (e.g. If the Trade is a "Limit" order then check that a value has been entered for the price, otherwise this field should be blank) are checked on the client-side
- Using equivalence partitioning techniques, all data entry fields will be checked to ensure that they are able to accept valid values and that their error checking routines can handle invalid data appropriately
- All basic data formatting checks are performed on the client-side
- All client-side checks are re-checked on the server-side

UICS7 - Medium
Any SSI/XSSI scripts used by the Web page must meet the following requirements:
- Each "include" file contains a "start of file" and "end of file" comment
- No "include" file references another "include" file, unless specifically approved (while technically possible this programming style can be difficult to debug and can also impact performance)
- The SSI EXEC command is not to be used anywhere within a script

UICS8 - Medium
Questionable coding "styles" will be determined by running the "Tune Up" HTML style checker, any errors/warning must either be fixed or approved.

UICS9 - Low
Any Pop-up used on the Web page meets the following requirements:
- The pop-up follows B&D's Web GUI standard (as opposed to B&D's Windows/P.C standard)
- The pop-up is not too large for the parent window
- The pop-up's initial screen positioning is appropriate

Content

UICN1 - Medium
B&D's name and logo is be clearly visible on the page

UICN2 - Medium
All dates, telephones #, postal addresses and currency amounts should be displayed using standard U.S business formats e.g. mm/dd/ccyy or ccyy format. However, input fields should be able to accept international variations e.g. alphanumeric postal codes

UICN3 - Low
All text must be spell checked with a US English spell checker (e.g. FrontPage), obvious exceptions to this rule include any page that has been specifically designed for non English speaking countries

UICN4 - Low
Common U.S phrases or expressions should not be used if it is possible for the international user to misinterpret their meanings e.g. "Buy this stock" maybe misinterpreted as a recommendation from B&D rather than mealy a convenient button for actually buying a stock online

UICN5 - Low
The narrative content of any edited article should be understandable by a viewer with a reading age between 16 and 25, lower than 16 and the "average" investor may find the article too simplistic, higher than 25 and a significant percentage of viewers may find the article too challenging. The reading age will be calculated using Word 2000

UICN6 - Low
No "hidden" text is to be used

Functional

UIFU1 - High
The Web page implements all of the business requirements described in its' associated requirements specifications. Acceptable functional should be checked for under the following adverse client-side conditions:
- Browser does not support JavaScript 1.2 (or the client has disabled Javascript)
- Browser does not support cookies (or the client has disabled cookies
- Browser does not support CSS (or the client has disabled CSS)
- Browser has disabled graphics (initial estimates are that 5% of B&D's clients do this)

Legal

UILE1 - High
No content that is copyrighted or trade marked by another organization is to be used without explicit written agreement by that organization

UILE2 - High
Meta tags do not contain other companies' trademarks, brand names and/or copyrighted phrases.

Marketing

UIMA1 - Medium
Keyword and Description Meta tags (as defined by the Marketing department) will be used on all public Web pages i.e. those Web pages that can be accessed without a valid login/password. All non-

public Web pages must include the following meta tag: <meta name="robots" content="noindex,nofollow">

UIMA2 - Medium
The Web page must contain a B&D copyright Meta tag

UIMA3 - Medium
The Meta tags for the Web page will be checked for possible Marketing/Search Engine problems by running the 3rd party tool "Scrubby"

UIMA4 - Low
HTTP- EQUIV Meta tags are not be used (some browsers no not support this type of Meta tag)

Navigation

UINA1 - High
All the links on the Web page will be checked to ensure that they meet the following specifications:
- The link should not be broken (unless the target has not yet been developed) and goes to the most appropriate location
- The link will not alter the browser's default link colors
- The link must have an associated "Title" link tag specified
- The link text does not wrap to two lines (this may confuse visitors into thinking that there are two links instead of one)
- If the link points to a directory (instead of a specific Web page), the link ends with a slash
- Internal URL links should reuse the existing browser instance (the exception would be any help pop-up Windows)
- Internal links must use relative addressing rather than absolute
- Internal links must use lowercase characters for the address
- External URL links should spawn a new browser instance

UINA2 - Medium
Each page must have a meaningful page name and meet the following bookmark/favorite requirements:
- The Web page must be bookmarkable (e.g. this can be problematic with framesets)
- No bookmark is longer than 32 characters (browsers typically truncate the display and verbose descriptions
- The bookmark must start with "B&D – "

Performance

UIPE1 - Medium
The total file sizes for all the files that need to be downloaded in order to view the Web page must not exceed 100k (total size will be calculated using FrontPage or Astra Site Manager). Exceptions to this rule must be approved

Reliability

N/A

Security

UISE1 - High

Input data received from the client must be parsed to make sure that it does not contain "out of bounds" or "buffer overflow" input data (e.g. a client enters a value of 13 or 99999999999999999999999999 for a month)

UISE2 - High

Input data received from the client must be parsed to make sure that it does not contain inappropriate meta-character sequences e.g. &&

Usability

UIUS1 - Medium

Content makes up 50% to 80% of the Web page's "screen real estate"

UIUS2 - Medium

Critical information has not been placed on the lower portion of the Web page (if the position of this information requires the user to use scroll down, the majority of visitors are unlikely to ever read it)

UIUS3 - Low

Mandatory data entry fields may be flagged with a visual cue e.g. highlight in red

UIUS4 - Low

Related information is grouped together on the Web page to minimized eye movement

UIUS5 - Low

There are no competing/duplicate actions/options on the Web page, which might confuse the user or cause them to make an error

UIUS6 - Low

When viewed via the clients anticipated hardware/software the page fits without the need for a horizontal scroll bar

UIUS7 - Low

Multiple key combinations can also be entered sequentially or are mapped to a single key

4.   Features and Functions not to Test

Notable features and functions that will not be tested include: None

5.   Test Deliverables

Incidents and defects from this test plan will be included in the combination unit/integration incident/test summary report.

6.   Test Environment

The development environment will be used for all unit and integration tests.

BDonline
Release 1.0
CODE QUALITY ASSURANCE TEST PLAN

Version 0.9

December 2000

Billy Crosby
Head of Quality Assurance
Brown & Donaldson

Code Quality Assurance Test Plan

1. Test Plan Identifier
BDonline release 1.0 CQTP 0.9

2. Introduction
The purpose of this phase of testing is two fold: first, as a means of ensuring the quality of the unit/integration testing process (i.e. are the team members responsible for performing the unit/integration testing following the guidelines specified in the unit/integration testing test plan) and secondly, as a means of ensuring that the next release of the application has been sufficiently tested at the Unit/Integration level and thereby is "fit enough" to warrant further testing at a higher level (i.e. the application meets the system testing phase entrance criteria).

The strategy employed for this phase can be summarized as follows:
- A small, randomly selected group of units (e.g. Web pages) will be retested using the unit/integration test plan, the results of which, should exactly match the results obtained during the unit/integration phase
- Since the QA department is relatively small and does not have the resources to conduct all the these tasks, the QA department will "borrow" staff and resources from the development and testing teams, these individuals will temporarily report to the head of QA and will not be assigned any unit that they have previously been connected with
- Once the original set of unit/integration tests have been validated (via the random re-testing), a decision will be made as to whether the discrepancies (if any) between the original results and the re-test results, indicate a failure in the unit/integration testing process. If the head of QA determines that the unit/integration process is operating in a less than optimal manner, then the head of QA will call a meeting of the project review board to discuss what actions should be taken to improve the situation
- The second assessment that the QA manager will make, based of the results of the original unit/integration testing and the re-test results, is as to whether or not this release meets or exceeds the previously agreed upon entrance criteria for the next testing phase (i.e. system level testing). In the event that this release does not meet those requirements, the QA manager will call a meeting of the project review board to discuss what actions should be taken as a result of this discovery

3. Features and Functions to Test
The scope of this phase of testing will include any of the units (e.g Web pages, database stored procedures, graphic files etc) that comprise the BDonline application.

In time permits, 5% of the application under test will be retested i.e. if the application is composed of 1000 Web pages, database procedures, graphic files etc, then 50 units will be randomly selected and re-tested. If few problems are encounter, the 5% quota maybe reduced for future iterations.

All of the test cases used in this phase will be based on test cases from the original unit/integration testing test plan. Where possible, each unit that has been selected for re-testing should be 100% re-tested using the very same test cases that were theoretically performed on this unit during the unit/integration testing phase.

4.   Features and Functions not to Test
No attempt will be made to review the comprehensiveness of the test cases specified in the unit/integration testing test plan or the desirability of the coding practices specified in the development standards. A separate task (initiated at project start-up) developed the development and testing standards and was subject to a separate review and approval process.

5.   Test Deliverables
Incidents and defects from this test plan will be included in the combination code quality assurance incident/test summary report.

6.   Test Environment
Where possible the same test environment will be used for code quality assurance testing as was used for unit/integration testing.

BDonline
Release 1.0
SYSTEM TEST PLAN

Version 0.9

December 2000

Mary Catchall
Test Manager
Brown & Donaldson

1.   *Test Plan Identifier*
BDonline release 1.0 SYTP 0.9
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test
Documentation

2.   *Introduction*
This test plan outlines the tests that will be conducted by the testing team the majority)or all) of the
individual units that make up the BDonline application have been initially tested and found to be free
of significant error.

Rather than assigning a portion of the application to an individual tester and expecting them to
thoroughly test al the different aspects of the application (functionality, usability, performance etc).
Testers (or teams of testers) will be expected to a single aspect of the entire application e.g. one team
will performance test the entire Web site/application, while another will concentrate on just usability.
This approach was selected, because it was felt that this strategy would allow for more tests to be run in
parallel and hence would have a shorter elapsed time frame and would also potentially have a shorter
leaning curve for the testing group, who have had relatively little experience testing Web
sites/applications.

3.   *Features and Functions to Test*

Accessibility
SYAC1 - Low
The Web page is understandable when heard through an audio-only browser (Home Reader)

SYAC2- Low
The colors used on this Web site are friendly to color blind viewers

SYAC3- Low
The Web page is understandable when viewed through a text-only browser (Lynx)

Audit
SYAU1- High
An Audit trail is created in line with B&D's auditing requirements

Availability
N/A

Coding standards

SYCS1 - High

The entire Web site will be scanned by LinkBot's HTML code validation utility to ensure that the code is written to W3C HTML 4.0 standards (any exceptions must be documented and approved). Note, this scan should not detect any new problems, as this test should have been performed during unit testing (and the process QA'ed during the code QA phase). However, because the cost of running this automated check is relatively low, it was decided that this check should be repeated at the system level.

Compatibility

SYCO1 - High

Using information from B&D's existing "brochureware" Web site log's and input from the Marketing department. B&D decided to support the following client-side software:

Operating System	Browsers	Plug-Ins
Windows ME	MS IE 5.5	Acrobat 4.0
Windows 98 SE	MS IE 4.0	Acrobat 3.0
Windows 2000	Netscape 6.0	
Windows NT 4.0 WS	Netscape 4.0	
	AOL 6.0	
	AOL 5.0	
Total = 4	Total = 6	Total = 2

Note, only general release software is used. No OEM, SP, or Beta versions are used with the exception of any required Y2K patches that are necessary in order to make the product work post Y2K. In addition, all of the installations used the installation defaults for directory names, cache sizes, fonts, plug-ins etc

Using the Aetgweb tool, the following "pairwise" combinations were identified as candidate combinations for testing possible client-side software configurations.

Test Case #	Operating System	Browser	Plug-In
1	Windows ME	MS IE 4.0	Acrobat 4.0
2	Windows 98 SE	Netscape 4.0	Acrobat 3.0
3	Windows 98 SE	Netscape 6.0	Acrobat 3.0
4	Windows 98 SE	AOL 5.0	Acrobat 4.0
5	Windows NT 4.0	MS IE 5.5	Acrobat 3.0
6	Windows NT 4.0	Netscape 4.0	Acrobat 4.0
7	Windows NT 4.0	Netscape 6.0	Acrobat 3.0
8	Windows NT 4.0	AOL 6.0	Acrobat 3.0
9	Windows 2000	MS IE 4.0	Acrobat 3.0
10	Windows 2000	MS IE 5.5	Acrobat 3.0
11	Windows 2000	AOL 6.0	Acrobat 3.0
12	Windows 2000	AOL 5.0	Acrobat 3.0

13	Windows ME	AOL 5.0	Acrobat 3.0
14	Windows ME	Netscape 4.0	Acrobat 3.0
15	Windows 98 SE	AOL 6.0	Acrobat 4.0
16	Windows 2000	Netscape 6.0	Acrobat 3.0
17	Windows ME	MS IE 5.5	Acrobat 4.0
18	Windows NT4.0	MS IE 4.0	Acrobat 3.0
19	Windows ME	Netscape 6.0	Acrobat 4.0
20	Windows 98 SE	MS IE 5.5	Acrobat 3.0
21	Windows 2000	Netscape 4.0	Acrobat 4.0
22	Windows NT 4.0	AOL 5.0	Acrobat 4.0
23	Windows 98 SE	MS IE 4.0	Acrobat 4.0
24	Windows ME	AOL 6.0	Acrobat 3.0

Using Ghost, each of the 24 configurations were saved out to a network drive and then downloaded to a host test machine as needed. Testing consisted of:

- Running a subset of the Functional test cases on each of the 24 platforms to ensure that the Web site/application performs as expected
- Viewing each Web page to ensure that the page is displayed as intended (e.g., no horizontal scroll bars) using the minimum pixel resolution e.g. 800x600

Content

SYCN1 - High
Real time content (e.g. stock quotes) should not be more than 30 minutes old

SYCN2 - High
Stock trades are executed within regulatory guidelines

Functional

SYFU1 - High
Every Web page on the Web site is re-checked to ensure that all of the business requirements described in the Web site's requirements specifications have been implemented correctly. Note, in theory these tests should not detect any new problems, as this functionality should have been performed during unit testing (and the process QA'ed during the code QA phase). However, because the high business risk associated with the functionality of this application, the business logic used to provide the functionality of the Web site will be manually retested.

SYFU2 - High
All multi-page transactions, which require the browser to maintain some sort of session with the Web site, will be tested to ensure that the session is maintained under the following conditions:

- Testers clears the disk and/or memory cache mid-way through a series of Web pages
- Tester uses the browser's Back (and subsequently Forward) buttons mid-way through the series of pages (forms)

- Tester uses the Go and/or History buttons to revisit previous pages out of synch
- Tester uses the browser's Reload button mid-way through a series of pages
- Tester resizes the browser window mid-way through a series of pages
- Tester aborts mid-way though the series of pages
- Tester takes an extended break mid-way through a series of pages e.g. a 30 minute coffee break
- Tester resets the PC's clock (backward by 1 hour and 1 day) mid-way through a series of pages
- Tester uses two browsers (same brand and version) and the same client account to perform two instances of the same transaction, "flip-flopping" from one browser to the next
- Tester uses two or more browsers (same brand, <u>different</u> versions) and the same client account to perform two instances of the same transaction, "flip-flopping" from one browser to the next

Note: To assist the tester, State Transition diagrams will be developed for all of the high-risk multi-page transactions.

<u>SYFU3 - High</u>

All Web pages containing a Form will be checked to ensure that any data entered into a Form is not lost or added to the database twice under any of the following conditions:

- The user clicks the browser's Back (and subsequently Forward) buttons mid-way through a series of forms
- The user clicks the browser's Forward (and subsequently Back) buttons mid-way through a series of forms
- The user clicks the Go/History buttons to revisit previous forms
- The user clicks the browser's Reload button mid-way through a series of forms
- The user clicks the Bookmark/favorite buttons mid-way through a series of forms.
- The user resizes the browser window

<u>SYFU4 - Medium</u>

The Web site may use a maximum of one persistent cookie, this cookie should:

- Expire after 6 months
- Not contain sensitive data e.g. password or users access level
- Fail "gracefully" if a user does not have cookies enabled (or the browser does not support cookies). Note: "gracefully" means either informing the viewer that the page can not be displayed because of the browsers current limitations or redirecting the visitor to a Web page that displays equivalent information without using the unavailable feature
- Disable cookies before accessing the Web site and ensure the Web site either works correctly (albeit more slowly) or issues a warning message informing the visitor that the site can only be access with cookies turned on (this would be a usability incident)
- Disable cookies mid-way through a transaction and see if the Web site is able to detect this situation and then handle it "gracefully"
- Delete the Web site's cookie mid-way through a transaction and see if the Web site is able to detect this situation and then handle it "gracefully"
- Clear the memory and disk cache mid-way through a transaction (session cookies are stored in memory and typically are never be sorted on a hard drive)
- Edit the cookie (using Wordpad) and change some of the data:
    - Add additional parameters
    - Delete parameters

- o Swap parameters
- o Set some parameters to null
- o Set some parameters to higher or lower values that their range would normally allow
- o Add control characters (e.g. carriage return) or special commands that the Web server's O/S (e.g. Windows 2000) recognizes as system commands
- o Add multiple entries of the B&D Web site in Netscape's cookies.txt file
- Is able to deter a cookie from a previous version of the Web site and handle the situation gracefully

SYFU5 - Medium
The set of cookie tests will be repeated, only this time from the same client using:
- Two browsers (same brand and version) to access your Web site
- Two or more browsers (same brand, different versions) to access your Web site

SYFU6 - Medium
Manually compare the high level functionality outlined by the Web site map with the functionality actually available on the Web site to ensure that the Web site map contains all of the high level functionality available and that the map does not contain any functionality that has not been implemented

SYFU7 - Medium
The application is checked to ensure that all client-side validations are repeated on the server-side in case the user has disabled client-side scripting (checking).

SYFU8 - Medium
All aborted/uncompleted transactions must be rolled back cleanly

SYFU9 - Medium
All Web site/application resources are released in a timely manner e.g.:
- Server memory is freed when a user completes a session or a transaction
- Network connections are properly closed when a user completes a session or a transaction
- Disk space is freed when a user completes a session or a transaction
- Software licenses are freed and made available to other users when a user completes a session or transaction

SYFU10 - Low
All dates/times should be based on the Web site's clock (Web server or Database server) not on the clients

Legal
SYLE1- High
The Web site must display all relevant regulatory disclosures (especially during new account set up).

SYLE2- High
Tax/Regulatory commissions for all eligible municipalities will be collected.

SYLE3- High
B&D meets or surpasses all of the claims made on the Web site

SYLE4- Medium
The Web site must display a legally valid B&D's disclosure/privacy statement

Marketing

SYME1- Medium
The Web site provides current and prior data on Web pages access statistics, such as hits per hour/day/week/month etc. correctly

SYME2- Medium
The Web site counts "click-throughs" to sponsor Web sites (reporting should be via the Web site's Web log analysis tool) accurately

Navigation

SYNA1 - High
Using several automated link-checking tools e.g. Astra Site Manager and LinkBot, all of the internal and external links will be checked to ensure that none are broken. If a significant number of broken links are detected, further navigational test case execution will be suspended until these defects have been rectified.

SYNA2 - Medium
The Web site should have a customized (user-friendly) 400, 401, 402, 403 and 404 error page(s).

SYNA3 - Medium
All Web pages will be manually traversed to ensure the following navigational coding/design standards have been implemented correctly:
- Internal URL links should reuse the existing browser instance
- External URL links should spawn a new browser instance and point to a business partner's home page without passing parameters. Deviations (while acceptable under certain business circumstances) will be reported as incidents
- Each link is accurate and appropriate e.g. the Trade link does not actually link to the Glossary page
- Standard browser controls (back, forward, reload) should work correctly i.e. the browser default page navigation and history must not be manipulated with

SYNA4 - Medium

All Web pages should be reachable within 5 clicks of the Home page (using a scroll bar counts as a click), excepts include pages that are part of a multi page transaction and should not be reached without traversing other pages within the transaction. LinkBot will be used to provide an automated estimate of this count, with potentially failing Web pages being confirmed by manual tests

SYNA5 - Medium
The Web site does not contain any orphaned files (i.e. files that can not be reached by following any path from the Home page).

SYNA6 - Low
If a link is being re-directed, it goes to the correct final destination and is not itself re-re-directed.

SYNA7 - Low
All Web pages on the Web site can be found by casually browsing the Web site (i.e., no need to resort to a site map or search engine

Performance

Before designing the performance tests for the BDonline application, B&D reviewed the Web logs for their existing Web site to obtain a few basic usage statistics:

- The current B&D Web site receives approximately 5 million hits and 1.2 million page views per day, this is approximately 100% more than the same time a year earlier and the Marketing department expects a corresponding increase over the coming year.
  Note, the statistics program being used on the current Web server (WebTrends) defines a hit as a file request e.g. a Web page that was made up of 1 HTML script and 9 graphic would actually cause 10 hits to be registered for each page view (impression). For performance testing purposes total Web site "hits" are not a very useful measure, page views will be used instead.
- 90% of the page views occur during regular US business hours i.e. 9-6pm EST Monday-Friday.
- The average (mean) visitor stays logged on to the Web site for 10 minutes, during which time they view 20 pages i.e. the average (mean) think time for a visitor is 30 seconds.

For the purposes of designing realistic test loads, a few additional assumptions will be made (once the Web site goes live and additional Web site statistics are collected these assumptions can be refined):

- Approximately 40% of the page requests are for pages that require some sort of database interaction
- Assuming 1080k of the 1.2 million page views (i.e. 90%) occur during a 9 hour period and allowing for an additional growth rate of 100%. The Web site must be able to provide an acceptable response time for a sustained workload of **120k page views/hour** (1080k/9). In addition, the Web site should be able to handle spikes of up to **360k page views/hour** (using a Normal/Spike ratio of 3:1).

Therefore, the number of virtual users needed to simulate a normal workload would be **1000** (120k pages/60 minutes/2 page requests per minutes) and a spike workload could be emulated with **3000** (360k/60/2).

The following response times (round times) have been defined as acceptable for a visitor accessing the B&D Web site via the internet from the lower 48 states using an average PC with a 28.8kb modem that

is connected to a tier 1 ISP and a 5.x generation MS IE/Netscape Windows based browser) during U.S business hours (m-f 8-9 EST):
- Home page and pages with no database interaction – 95% of pages must be completely downloaded within 10 seconds
- Pages with database interaction – 95% of pages must be completely downloaded within 10 seconds

From a performance perspective, page requests can be broken down into two types:
- Transactions that involve a some form of database interaction e.g. buying or selling stock
- Static information retrieval e.g. viewing the glossary

A script/scenario will be developed that seeks to mimic the typical visitor, with a 60/40 mix of non-database/database page requests being used for load testing.

Performance testing of the Web site/application will be conducted in the following stages:
- The infrastructure of the proposed new production Web site will be benchmarked using an industry standard benchmark.
- An initial manual "smoke" test will be conducted to determine whether the Web site is anywhere near ready and if not which Web pages are the potential network bandwidth hogs.
- Assuming the Web site/application passes the 'smoke' test (or system performance testing entrance criteria), a medium scale performance test (100's of virtual users) will be conducted by the B&D staff.
- Assuming the Web site/application passes the medium scale performance test, a series of large-scale performance tests (1000's of virtual users from many US geographic locations) will be scheduled.
  Note, since the system test environment is a smaller version of the production environment, the results obtained from the large scale tests will need to be adjusted to take in to account the greater capacity of the production environment.

SYPE1 - High
Using the WebStone benchmarking tool, various infrastructure configurations will be evaluated to determine the optimal setup, these results (where possible) will then be compared to the results obtained from comparable Web sites to ensure that the B&D Web site is as efficient as the typical (average) implementation.

SYPE2 - Smoke
A ballpark estimate of the Web site/application's speed will be determined by using a single client with a 28.8k modem and a stop watch to estimate page response times for some of the "core" Web pages. Two browsers and O/S's will be used to ensure that a specific browser or O/S does not skew the results:
- Windows 98/Netscape 4.7
- Windows ME/MS IE 5.5

SYPE3 - Smoke
An initial estimate of which Web pages may cause excessive network traffic (and hence slower than desired download times) will be determined by running the following 3rd party performance analyzers (they all base their estimates on the file sizes of the files that make up a Web page):
- Astra site manager
- Bobby

- LinkBot
- Tune up

SYPE4 – Pre-test
Unfortunately, a load generator is by it's very nature an intrusive tool i.e. the system requirements being placed on the machine being used to generate the load may actually effect the response times being reported by the machine. Therefore before conducting a load test, the load generators must first be calibrated, this will be done by varying the number of virtual users the load generator is mimicking (in increments of 100) and measuring the HTTP network traffic that the load generator is able to send. Note: Even a well-engineered tool with a powerful server will display some degradation as the number of virtual users increases, the question is by how much? Once determined, the number of "effective" virtual users for each increment can be estimated.

SYPE5 - High
The load generators connected via a dedicated T3 Internet connection will be used to generate the background load using load increments of 100 virtual clients. Two "Mid Range PCs" will be used (one connected via a separate ISP over a 28.8k Modem and the other using the T3 connection, by capped at 28.8 by the testing tool) will be used to probe the Web site being tested and measure response times (roundtrip times).
Note, before commencing a test run, the Web site under test will be "warmed up". This will entail generating a test load for 10 minutes beforehand, thereby allowing the Web server to prime itself (e.g. filling up buffers, swapping into memory relevant DLL's etc.) and therefore generate more realistic response times.

SYPE6 - High
Once acceptable performance results have been achieved with the medium scale performance tests, the performance tests will be repeated using larger work loads generated by two 3rd party load generators (envive and keynote). Note, a second company is used to verify that the load being generated by the first is accurate (i.e. the performance results from both companies should be virtually the same), once the accuracy of the loads being generated have been verified, one of the two 3rd parties will be dropped.

SYPE7 - High
The legacy systems will be checked to ensure that they are able to handle the increased workload due to the addition of the Web site. This will be confirmed by running the anticipated peak load against the Web site/application while the legacy systems are also experiencing a peak demand. Note, the legacy systems may follow a different business cycle such as end of month and/or quarterly processing

SYPE8 - High
The final set of performance tests will attempt to saturate the Web site to determine what happens when the Web site experiences a workload greater that it is capable of handling. Since the test environment is only a scaled down model of the production environment, the maximum load that the system test Web site can handle will not be indicative of the capabilities of the much larger production environment.

SYPE9 - Low

If time permits, load tests will re-executed, substituting the eLoad (part of the eTester suite) tool for the WebLoad tool:

a) Load generator
b) Probing client
c) Load Generator and Probing client

With hopefully similar results being reported, thereby validating the accuracy of the testing tools.

Reliability

SYRE1 - High
The Web application was able to handle (albeit very slowly) the worst load that can be expected to occur at least once a month

SYRE2 - High
After a server is unexpected restarted, are all the transactions that were mid-way through being processed, rolled back/aborted cleanly

SYRE3 - Medium
The Web application is able to run for long periods of time (i.e. at least one week) without any noticeable deterioration in resource utilization.

SYRE4 - Medium
Restarting any of the servers does not significantly improve performance (symptomatic of a memory leaks).

SYRE5 - Medium
The Web application was able to successful processed an entire week's worth of input data.

SYRE6 - Medium
Can the failover/recovery take place within the required time period (SLA)? Especially when the Web site is operating under stressful conditions

SYRE7 - Medium
The Web site/application is able to "gracefully" handle one or more of the legacy systems being taken off-line

SYRE8 - Medium
Can the Web site handle one or more of the servers being saturated to the point where either the server automatically reboots it self or completely locks up?

SYRE9 - Medium
Can the Web site handle individual servers being unexpectedly turned off and/or rebooted without warning? e.g. the load balancer

SYRE10 - Medium

Can the system handle multiple server failures?

SYRE11 - Low
An estimate of the robustness of the Web site will be determined by randomly selecting several data entry fields for destructive error routine checking. An HTTP editor will be used to modify the values in the data entry fields submitted to the Web site, using values that could not have been entered via a browser. These "illegal" values will be submitted to the Web site to check its error handling are robust enough to handle this unusual event.

SYRE12 - Low
Taking the Web site/application off-line does adversely impact any of the legacy systems.

SYRE13 - Low
The Web application can function correctly (albeit very slowly) on servers with minimal available resources

Scalability

SYSC1 - High
A manual "ball-park" calculation is used to check that the servers on the Web site have sufficient resources to handle the initial request volume.

SYSC2 - Medium
A manual "ball-park" calculation is used to check that the servers on the Web site have sufficient resources (assuming minor hardware and system software upgrades) to handle the expected volume in 12 months time, when traffic is expected to be 100% higher.

Security

SYSE1 - High
Check that the Web application requires sufficiently strong user ID's and passwords

SYSE2 - High
Check that the user is locked out for 30 minutes after 3 failed attempts to log in

SYSE3 - High
Check that the user is logged out after 30 minutes of inactivity

SYSE4 - High
Check that disabling/enabling any client-side setting (e.g. JavaScript) does not allow the client to circumvent any security measure

SYSE5 - High

Check that using any combination of bookmark/favorite, back/forward, history or go navigational jump does not allow the client to circumvent any security measure

SYSE6 - High
Check that all HTTPS/SSL encrypted uses 128bit key encryption

SYSE7 - High
Check that all sensitive data is encrypted during transmission, this includes cookies (session or persistent), hidden tags on an HTML form or via "long URLs" (e.g. using the HTTP Get command)

SYSE8 - Medium
Check that the HTTP Post command (as opposed to the HTTP Get command) is used to transfer all data to the Web site

SYSE9 - Medium
Check that password and/or user ID files/tables are not named "password", "user" or another obvious name

SYSE10 - Medium
Check that the information used to authenticate a client (e.g. mother's median name, social security # etc) who has forgotten his/her user ID/password is stored in a separate database to the database containing the client's accounts

SYSE11 - Medium
The test system will be checked to make sure that it is not directly connected to the "outside World", thereby creating a potential security risk.

Site Recognition
N/A

Usability
SYUS1- Medium
The Web site must "degrade gracefully" for users who have a browser that is does not provide the functionality needed by the Web site (e.g. Javascript) due to either the browser not having that functionality (e.g. an old version) or because the viewer decided not to enable that particular feature (e.g. cookies turned off). Particular attention should be paid to clients with "paranoid" security settings.

SYUS2- Medium
Using a Use Case approach, test scenarios and scripts will be developed for some of the most common user activities. The number of "clicks" needed to complete each scenario will then be measured and compared to equivalent activities on B&D's competitors Web site. An incident will be logged for any scenario that requires significantly more clicks to perform the scenario than that taken by anyone of B&D's competitors.

SYUS3- Medium
The users mental model is consistent across the entire Web site, e.g. The Web pages controls, behavior and even aesthetics remain the consistent

SYUS4- Low
The Web site will be checked to ensure that the Web site's client-side requirements are clearly displayed i.e. a monitor with 800x600 resolution supporting 256 colors and a browser that supports W3C HTML 4.0 and JavaScript 1.2, CSS level 1 and Cookies.

SYUS5- Low
The colors used on this Web site are accurately displayed when using the minimum expected number of colors on a client

4.   *Features and Functions not to Test*
Notable features and functions that will not be tested include:

Performance
Due to budgetary constraints, the system test environment is not an exact replica of the production environment. Therefore, the results of these performance tests may not exactly match the results that will be obtained once the BDonline application is promoted to the production environment.

Subtle variations on the client machines such as different Browsers (brand or version), O/S's, HTTP protocols (1.0 Vs. 1.1 or "stay alive"), caching (Browser, DNS and SSL), cookies, virtual client threading (single Vs. multi) and site certificate verification & encryption will not be tested. It is hoped that the Web site will pass/fail by a wide enough margin that these performance variables would not significantly effect the test results.

Since the system test environment is not an exact replica of the production environment, no attempt will be made to bring the system test Web server to its knees. It will therefore not be possible to predict the maximum load the production Web server can handle.

No attempt will be made to gauge performance times from geographic locations outside of the USA e.g. Europe or Asia.

Security:
While the system test environment is suppose to have the same security configuration settings as the production Web site to ensure that functional and performance test results on the system test environment reflect the results that would be obtained in the production environment. He was felt that testing the infrastructure of a non-production system would provide little guarantee (and hence a poor ROI) that the production system had been appropriately configured. Therefore the system test plan will not include any security tests designed to ensure that the Web site infrastructure (as opposed to the Web application) is protected from attacks by hackers (internal or external). The only exception, being

to ensure that the test environment itself is not a security risk, by checking that it is not directly connected to the "outside World".

Usability:

No International usability testing will be conducted for the first release of the Web site/application.

5.   *Test Deliverables*

Incidents and defects from this test plan will be included in the combination system incident/test summary report.

6.   *Test Environment*

The system test environment will be used for the server-side configuration and Windows ME desktop P.C running Opera 5.0 will be used (unless otherwise stated) for the client-side configuration. Windows ME was chosen because this is the O/S that is currently installed on the majority of the testing team's desktop P.C's, while Opera was chosen because of it's strict adherence to HTML/JavaScript standards, making it easier to spot such errors.

Note: Since some performance tests will be conducted over the Internet it is not possible to ensure that intermediaries (e.g. B&D's ISP) are not caching frequently requested Web pages, indeed it is quite possible that this anomaly may cause times reported by the testing tools to be better than the times that will actually be experienced by "real" users accessing the Web site from geographically scattered locations.

BDonline
Release 1.0
SYSTEM QUALITY ASSURANCE & ACCEPTANCE TEST PLAN

Version 0.9

December 2000

Billy Crosby
Head of Quality Assurance
Brown & Donaldson

<u>System Quality Assurance & Acceptance Test Plan</u>

1.   Test Plan Identifier
BDonline release 1.0 SQTP 0.9

2.   Introduction
The purpose of this phase of testing is three fold: first, as a means of ensuring the quality of the system testing process (i.e. are the team members responsible for performing the system testing following the guidelines specified in the system testing test plan) and secondly, as a means of ensuring that the next release of the application has been sufficiently tested at the system level and thereby is "fit enough" to be placed into production. Lastly, the project sponsor will be given a final opportunity to use the system and determine whether or not the application will adequately meet B&D's business needs.

The strategy employed for this phase can be summarized as follows:
- A risk assessment will be made of the Web site/application
- The test cases designed to detect/mitigate any of the "high" risk features or attributes of the Web site/application will be re-tested
- Since the QA department is relatively small and does not have the resources to conduct all the these tasks, the QA department will "borrow" staff and resources from the development and testing teams, these individuals will temporarily report to the head of QA and will not be assigned any portion of the system that they have previously been connected with
- Once the original set of "high" risk system tests have been validated (via the random re-testing), a decision will be made as to whether the discrepancies (if any) between the original results and the re-test results, indicate a failure in the system testing process. If the head of QA determines that the system process is operating in a less than optimal manner, then the head of QA will call a meeting of the project review board to discuss what actions should be taken to improve the situation
- The second assessment that the QA manager will make, based of the results of the original system testing and the re-test results, is as to whether or not this release meets or exceeds the previously agreed upon release criteria for placing this release of the application into production. In the event that this release does not meet those requirements, the QA manager will call a meeting of the project review board to discuss what actions should be taken as a result of this discovery
- Finally, the project sponsor (or representative of) will conduct ad-hoc testing to ensure that the application has realized the vision that the sponsor had wanted implemented. If the sponsor deems that this vision has not been met, then the sponsor will call a meeting of the project review board to discuss what actions should be taken as a result of this assessment.

3.   Features and Functions to Test
The scope of this phase of testing will include any of the features or attributes (e.g. accuracy of trading functionality, Web site performance etc) that comprise the BDonline application.

In time permits, all of the test cases designed to detect/mitigate any of the "high" risk features or attributes of the Web site/application will be re-tested. If time does not permit a full re-test of all of the "high" risk mitigating tests, then a random subset of these test cases will be selected and executed.

With the exception of some ad-hoc testing performed as part of the applications acceptance, all of the test cases used in this phase will be based on test cases from the original system testing test plan.

4.   Features and Functions not to Test
No attempt will be made to review the comprehensiveness of the test cases specified in the system testing test plan. A separate task (initiated at project start-up) developed the testing standards and was subject to a separate review and approval process.

5.   Test Deliverables
Incidents and defects from this test plan will be included in the combination system quality assurance incident/test summary report.

6.   Test Environment
Where possible, the system quality assurance tests will be executed on the version of the application hosted in a "staging" area of the production Web site i.e. the test environment should be an exact match of the production environment.

BDonline
Release 1.0
POST IMPLEMENTATION TEST PLAN

Version 0.9

December 2000

Mary Catchall
Test Manager
Brown & Donaldson

1.   Test Plan Identifier

BDonline release 1.0 PITP 0.9
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test
Documentation

2.   Introduction

Testing doesn't stop when the application goes into production – it's not a bounded interval event.
Instead, Web testing is a regular process that continues as long as the application is live. There are
many maintenance-testing activities that will need to be performed on a regular basis after the
application has been implemented. This test plan outlines the tests that will be performed on a regular
basis until either the Web site is replaced or decommissioned.

3.   Features and Functions to Test

Audit

PIAU1 - Medium
The production Web site logs are independently analyzed using at least two different Web log
analyzers to determine whether or not the Web site statistics (e.g. pages hits per hour/day/week/month)
being presented to advertising clients are fair and accurate.

PIAU2 - Medium
Spot checks will be regular performed (approximately once a month) to ensure that B&D's
configuration management procedures are being implemented correctly.

PIAU3 - Low
If permitted, business partner's Web site logs are independently analyzed using at least two different
Web log analyzers to determine whether or not the "click-throughs" from B&D's Web site to the
business partners Web site accurately reflect the estimates provided to the business partner by B&D
(original target was 500 per day)

PIAU4 - Low
Within six months of the BDonline application going into production, the Web site/application should
have succeeded in being endorsed by one or more of the following outside auditors:
- TrustE (truste.com/etrust.com)
- BBBonline (bbbonline.com)
- WebTrust (cpawebtrust.com)

PIAU5 - Low
Spot checks will be performed quarterly (using LinkBot) to ensure that no orphan files are left on the
production Web site.

PIAU6 - Low
Mail boxes for email accounts referenced by the BDonline application will be spot checked
(approximately once a quarter) to ensure that they are not more than 80% full

PIAU7 - Low

The file manager's and DBMS's statistics will be reviewed once a month to ensure that the files and database are being organized effectively.

PIAU8 - Low

One year after the Web site/application goes into production, the archival mechanisms will be reviewed to ensure that records are being archived and/or purged in a timely manner

Availability

PIAV1 - High

The Web sites/applications availability will be measured to ensure that it meets the satiated requirements of:
- 97% (or better) update during core business hours (4.00am to 10.00pm EST Mon-Fri)
- 90% (or better) update during non-core hours
- Mean time to repair (MTTR) 1 hour
- Maximum one 10 hour+ outage per month

Compatibility

PICO1 - High

Before a new server-side system software upgrade or patch is implemented on the production environment, a subset of the unit and system level compatibility, functional, performance and security tests will be rerun to ascertain whether the Web side/application will perform adequately with the new version of system software.

PICO2 - Medium

Upon the release of a major new browser or client-side operating system, a subset of the unit and system level compatibility tests will be rerun to ascertain whether the Web side/application will perform adequately with the new product/version.

PICO3 - Low

Web site logs will be analyzed once a quarter to determine if the usage of any client-side software product has changed significantly since the original release of the Web site/application and if so, an assessment will be made as to whether any or all of the unit or system level compatibility tests should be rerun against the increasingly popular software products/versions.

Content

PICN1 - High

Real time dynamic data (e.g. stock quotes) will be regularly checked to ensure that the data is not too old (or too young) e.g. free stock quotes should be between 20 and 30 minutes old

PICN2 - Medium
New content will be reviewed to ensure that it is not copyrighted or trade marked by another organization, unless explicit written agreement by that organization has been granted

PICN3 - Medium
All contact information (e.g. telephones #, addresses etc) are reviewed once a quarter to ensure that they are still accurate

PICN4 - Low
All content will be scanned once a day using an automated tool (e.g. FrontPage) to ensure that the text does not contain any spelling mistakes

PICN5 - Low
The content is always current and previously published content is available via an archive

PICN6 - Low
Samples of content will be randomly selected to ensure that the narrative content of any article should be understandable by a viewer with a reading ability of a US 12th grader (average 17 year old) i.e. a Flesch-Kincaid grade level score of 12. Therefore, a score of 10 to 14 would be deemed acceptable, lower than 10 and the "average" viewer may find the article too simplistic, higher than 14 and a significant percentage of viewers may find the article page challenging

Functional

PIFU1 - Medium
A baseline of the new Web site's functionality will be built using eTester's "spidering" capability. The baseline will consist of a capture/replay object aware script of the entire Web site, which can then be used for regression testing future incremental releases of the Web site.

Legal

PILE1 - High
As new laws (and interpretations of laws) related to the Internet are enacted. The Web site and application will be reviewed to ensure that they are both in compliance.

Marketing

PIMA1 - Medium
Within 2 months of the Web site going into production, the Web site should appear on the first results page of 8 out of 10 of the following Search Engines/Directories:
- Altavista
- AOL Netfind

- Excite
- HotBot
- InfoSeek
- Lycos
- Northern Light
- WebCrawler
- Yahoo
- Yellow Pages

For 8 out of 10 of the following keyword searches:

- Brown +Donaldson
- Online +Trade
- Online +Trading
- Online +Broker
- Brokerage
- Stocks
- Buy +Stocks
- Stock +Quotes
- NASDAQ
- NYSE

Two 3rd party search engine rating tools will be used to assess BDonline's rankings:

a) Web Metasearch
b) Site Analysis

PIMA2 - Medium
Six months after the BDonline application going into production, the Web server and database logs will be analyzed to determine how many clients are using the Web site (target was for at 10,000 unique visitors per day) and how many of these clients were active (target was for at least 50% to log in at least once a week).

PIMA3 -Medium
Identify the Web pages (top 5%) that have the highest abandonment rate

PIMA4 -Low
Rate in the top 50% of online brokerage Web sites, as measured by scorecard.com

Navigation
PINA1 - Medium
External Web page links will be regularly checked to ensure that they have not become broken/inaccurate. The checking will consists of a daily-automated check to ensure that no link has become broken and a weekly manual of high priority links (e.g. advertisements) to ensure that the link goes to appropriate content on the external Web site

PINA2 - Medium
Links from to the BDonline Web site from other Web sites (e.g. business partners) will be regular manually checked (weekly) to ensure that they are not broken or linking to inappropriate content.

PINA3 - Medium
The production version of the Web site must be accessible via http:\\www.xxx.com and http:\\xxx.com (where xxx is any and all of the domain names registered for BDonline).

Performance

PIPE1 - High
A subset of the performance tests conducted during system testing will be repeated on a daily basis using the services of an outside performance monitoring firm (i.e. Keynote systems) to ensure that the Web site's performance is not degrading over time.

PIPE2 - Medium
The ISP providing Internet connectivity for the Web site will be checked once a month to ensure that it meets or exceeds the service levels specified in their quality of service (Qos) contract. QoS measures include:
- Network availability
- Effective network throughput
- Network packet loss
- Network latency
- Network latency variation ("jitter")

PIPE3 - Low
Has a performance troubleshooting strategy been developed and implemented

Reliability

PIRE1 - Medium
During the first month of operation, server memory utilization will be regularly checked to ensure than memory leakage does not exceed 10k per day.

PIRE2 - Medium
Are data, system software and application software files being backed up off-site, at locations which have sufficient capacity to handle the ever-growing needs of the Web site.

PIRE3 - Low
Regular "Fire drills" are performed to ensure that the Web site/application can recover from a "disaster". "Disasters" could range in magnitude from a single hard drive crash to a complete power outage for the entire data center and in impact from a single trade being corrupted to the entire Web site being compromised by a hacker.

Security
PISE1 - High
An independent testing organization that specializes in testing the security of Web sites will be contracted to attempt regular (monthly or as needed) attempts to compromise the integrity of the Web site's infrastructure using newly acquiring knowledge of recently discovered security holes in the system software that B&D uses in it's Web site infrastructure.

PISE2 - High
An independent testing organization that specializes in testing the security of Web applications will be contracted to attempt to compromise the integrity of the Web application using standard application hacking techniques such as embedding system commands into input data. This testing will be repeated after each major upgrade of the application.

Usability
PIUS1 - Low
Emails to the Webmaster will be analyzed and categorized to help measure the usability of the Web site (target is for less than 10% of emails to the Webmaster to be complaints).

4.   Features and Functions not to Test
Notable features and functions that will not be tested include:

Marketing
Checking variations of BDonline domain name to determine/recommend other domain names that should be secured (e.g. from a defensive perspective to stop competitors from acquiring B&D like names and from an offensive perspective to try and improve B&D's search ratings/site traffic).

No check will be made to assure that the domain names used by BDonline are "owned" by B&D and not another party e.g. the ISP, or that the Administrative and Technical contacts registered with the domain name authority (e.g. Network Solutions) are accurate

5.   Test Deliverables
Incidents and defects from this test plan will be included in the combination post implementation incident/test summary report.

6.   Test Environment
The production environment will be used for all post implementation tests.

Template Test Plan

1.   Test Plan Identifier
BDonline release 1.0 XXTP 0.9
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test Documentation.

2.   Introduction
Brief overview of the approach/strategy used.

3.   Features and Functions to Test
List of test cases grouped into the following categories:
- Accessibility
- Audit
- Availability
- Coding standards
- Compatibility
- Content
- Functional
- Legal
- Marketing
- Navigation
- Performance
- Reliability
- Scalability
- Security
- Site recognition
- Usability

4.   Features and Functions not to Test
List of significant features and functions that will not be tested

5.   Test Deliverables
Incidents and defects from this test plan will be documented in a combination Test Incident/Summary report (see attached for template layout).

6.   Test Environment
Specification of the environment used for the test cases within this test plan.

Template Test Incident/Summary Report

1.   *Test Incident/Summary Report Identifier*
BDonline release 1.0 IS mm/dd/ccyy
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test Documentation.

2.   *Summary*
Summarize the evaluation of the test items. Identify the test items tested, indicating their versions/revision level.

3.   *Variances*
Report any variances of the test items to their design (explicit or implicit) specifications.

4.   *Comprehensive Assessment*
Evaluate the comprehensiveness of the testing process (compared to objectives listed in the test plans), identify any features/functions that were not sufficiently tested and explain why.

5.   *Summary of Results/Incidents*
Summarize the results of the testing. Identify all resolved incidents, their resolutions and optionally the impact the incident had on testing. Identify all unresolved incidents.

6.   *Evaluation*
Provide an overall evaluation of each test item including its limitations (if any). The evaluations should be based on the test results and the test item pass/fail criterias. An estimate of the failure risk may also be included.

7.   *Summary of Activities*
Summarize the major testing activities and events. Summarize resource consumption data e.g. total staffing levels, elapsed time etc.

8.   *Approval*
Names and titles of persons who must approve this report.

Template Test Log

1.   Test Log Identifier
BDonline release 1.0 TL mm/dd/ccyy
Note, the structure of this document is based on the IEEE 829-1998 Standard for Software Test Documentation

2.   Description
Information that applies to all of the entries in the test log e.g. hardware and system software being used for all tests.

3.   Activity and Event Entries
Testing start date/time & end date/time, names of the test log's author, tester & observers (if any) and actual results of test cases executions (see sample log below).

Test Id/Test Name	P/F	Incident Id	Result/Incident Description
UICS1: New Account Page HTML compliance	F	91	Page does not meet W3C HTML 4.0 standard (ran against W3C online validator - http://validator.w3.org/)
UICS2: New Account Page Restricted technologies	P		
UICS6: New Account Page Form Data Input	F	92	Transfer amount field allowed the client to enter the invalid amount $1000.999 (3 decimals) instead of 2 decimals
UICN1: New Account Page Corporate logo	P		
UICN3: New Account Page Spell check	P		
UICN6: New Account Page Hidden text	P		
UINA2: New Account Page Bookmarks	F	93	Page Name/Bookmark is incorrect - should say "B&D New Account Page" not "B&D Login Page"