भारतीय मानक
Indian Standard

IS 15883 (Part 9) : 2018

निर्माण परियोजना प्रबंधन — दिशा-निर्देश

भाग 9 संचार प्रबंधन

Construction Project Management — Guidelines

Part 9 Communication Management

ICS 03.100.30

© BIS 2018

June 2018 **Price Group 9**

FOREWORD

This Indian Standard (Part 9) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Management (Including Safety in Construction) Sectional Committee had been approved by the Civil Engineering Division Council.

A construction project is an endeavour undertaken by a project team on behalf of owner/client to create a built facility suited to the defined functional objectives. From inception to commissioning, the project goes through various distinct stages leading to progressive achievement of project objectives. Each stage involves specific inputs, processes (both technical and managerial) and deliverables. Typically, the life cycle of a project from commencement to completion involves the following stages:

a) *Project appraisal* — Inception, feasibility and strategic planning;

b) *Project development* — Project brief development, planning and design, finalization of proposals, procurement strategy, construction documentation including tender drawings, construction drawings, specifications, cost estimates, bills of quantities, procurement documents;

c) *Planning for construction* — Sequencing of project components, planning tools, resource planning and time cost trade off

d) *Tender action* — Open competitive bidding/pre-qualification of agencies, issue of tender documents, evaluation of bids, negotiations, if required and award of work;

e) *Construction* — Execution, monitoring, control, work acceptance; and

f) *Commissioning and handing over* — Contractual closeout, financial closeout, defect liability commencement, facility handing over.

The distinct features of a construction project include the temporary nature of the project team involved, the evolutionary process of project deliverables during project development stages and the unique output as the built facility. As a result of these features, unless there is efficient and effective project management, a construction project is faced with challenges of uncertainties leading to time over-runs, cost over-runs, changes in project parameters, loss of quality and inability to meet the functional objectives. While technical soundness of a proposal is an important aspect of a construction project, the management aspects, which involve techno-legal, financial and other issues, have also a significant role in the success of a project. Therefore, management functions and technical processes in a construction project need to be integrated towards achieving project objectives. Top management commitment plays an important role in harmoniously achieving these project objectives. In some of the public domain projects, it may be necessary to share relevant information with public at large through appropriate means.

To provide necessary guidance on effective construction project management, a series of standards are being developed as parts of IS 15883 'Guidelines for construction project management'. Part 1 General, of the standard since published as IS 15883 (Part 1) : 2009, covers general aspects of overall construction project management. This has been followed by publication of other parts as follows:

Part 2 : 2013 on Time management
Part 3 : 2015 on Cost management
Part 4 : 2015 on Quality management
Part 5 : 2013 on Health and safety management
Part 6 : 2015 on Scope management
Part 8 : 2015 on Risk management
Part 12 : 2016 on Integration management

The other parts of the standard are under formulation which will cover functions such as procurement management, human resources management and sustainability management.

Indian Standard

CONSTRUCTION PROJECT MANAGEMENT — GUIDELINES

PART 9 COMMUNICATION MANAGEMENT

1 SCOPE

1.1 This standard (Part 9) covers guidelines for communication management aspects of construction project management.

1.2 The communication management aspects during the project formulation and appraisal stage of the project are not covered in this standard. The scope of this standard, therefore, covers the stages subsequent to the stage of approval (when a decision to implement the project including its financing is taken) till commissioning and handing over stage of a project.

1.3 The provisions of this standard are to be read in conjunction with other parts of IS 15883.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
7337 : 2010	Glossary of terms in project management (*second revision*)
10400 : 2013	Glossary of terms in inventory management (*second revision*)
15198 : 2014	Glossary of terms in human resource development (*first revision*)
15883	Construction project management — Guidelines
(Part 1) : 2009	General
(Part 2) : 2013	Time management
(Part 3) : 2015	Cost management
(Part 4) : 2015	Quality management
(Part 5) : 2013	Health and safety management
(Part 6) : 2015	Scope management
(Part 7)	Procurement management (*under formulation*)
(Part 8) : 2015	Risk management
(Part 10)	Human resource management (*under formulation*)
(Part 11)	Sustainability management (*under formulation*)
(Part 12) : 2016	Integration management

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7337, IS 10400 and IS 15198 shall apply.

4 GENERAL

4.1 Need for Communication Management

4.1.1 Communication involves the transfer of information, a generic term that embraces knowledge, processed data, skills and technology. In any human endeavour, the quality of communication among the participants largely influences the success of relationships and outcome of endeavour. This is particularly true on a complex undertaking like a construction project where there are many project participants who collaborate for the project duration before disbanding to work on other endeavours. These specialist people and organizations prepare the scope, design, estimate, procure, contract, construct and commission a project. The level and length of participation of the participants varies depending on the stage of the project. These project participants usually work in teams and can be grouped as client team, consultant team and construction team.

4.1.2 The client team or internal project team includes project participants who work for the client organization. The main function of this team is to meet the client project responsibilities and to act in the interest of the client's business. The size and structure of the client team may change because of project type, project size and criticality, client organization's size and business, client's business, project participants' skills.

4.1.3 The consultant team provides expert skills and knowledge to define scope, develop and support the project. Consultant teams usually have members providing professional services in design and documentation, project management, cost management, legal services, town planning, building compliance, environmental management, safety management, sustainability practices, etc. Some of the roles would be executed by in-house teams.

4.1.4 The collaborating participants or organizations may be located in dispersed geographic locations. In present scenario, collaborating organizations could also be located in different countries and working in different

time zones. Each project participant has varying role, responsibilities, goals, work practices and culture. This creates special communication challenges, as collaborating organizations are required to efficiently exchange large number of technical and other documents during the life cycle of the project. Cooperation between participants with different backgrounds and working practices makes it important that effective communication processes and systems are established for sharing the most up-to-date information in order to carry out day-to-day tasks with least errors, reduced time delays and less time spent on redesign, rework and process management. It requires establishing clear channels of communication and documentation and defining adequate documentation system. This facilitates completion of construction projects as per estimated time, within budget, as per specifications and with minimum risk.

4.2 Structure of Communication Management

4.2.1 *Construction Communication Categories*

4.2.1.1 Communication for construction projects can be divided into five following groups:

a) Inter-office communication that is communication between head office team of participating organizations.

b) Intra-office communication that is communication between branch offices of respective participating organizations or between their head office and branch offices.

c) Site communication that is communication between project sites and head offices of participating organizations.

d) Intra-site communication that is communication between project execution team at site. This is important for large sites where single site office does not suffice the requirement for effective site management. This also includes communication between project site offices of participating organizations.

e) Communication with statutory bodies.

4.2.1.2 Communication from offices is easier to plan and manage as these are permanent facilities with established infrastructure and systems. But communication from site and within site is difficult to manage as sites may be in remote locations, site offices are temporary structures and site is exposed to weather conditions. Till pre-construction stage of the project, only office communication happens, but from execution stage of projects site as well as office communication happens.

4.2.1.3 Site communication includes the following:

a) Communication with offices for administrative purposes and getting technical information.

b) Communication between project site office and supervisors or executing staff at site location.

c) If it is a large project site with multiple project site offices, it would also include communication between multiple project site offices.

4.2.2 *Modes of Communication*

Conventionally, project team members, even those located internationally, meet in person at various stages of their respective projects. Although such structure helps build relationships, it rapidly becomes inefficient in terms of time and money. The result is that global networks face unique communication challenges different from those that are not geographically dispersed. Traditionally, team members use a combination of modes to communicate and store documentation, like: paper documents, E-mail, fax, couriers, drawing racks, folders, index cards, boxes, compactor storage, storerooms, desk, tool box, log books, in/out trays, offsite storage/archival, filing cabinets, fireproof safes, etc.

These traditional methods rely on expensive and time consuming manual entry and are unstructured with the tendency to create information 'silos' among project organizations. Inefficient management and storage of information is an extremely high ongoing cost to a project. This cost is not always easily measured, as the ramifications are more extensive than just time and storage space. Traditional management and collaboration methods may lead to problems such as poor document management, retention and compliance issues. This scenario leads to risk of disputes and litigation.

Projects have a combination of manual and electronic tools and systems to exchange documents; the suitability of a particular type being dependent on factors such as organizational requirements, contractual obligations, regulatory requirements, cost, capacity and ease of use. Present commonly used tools and systems include: E-mail, Hard drives (fixed and portable), local area networks, transmittals, fax, courier, traditional mail, collaboration systems, FTP sites, CD, DVD, wireless networks (Wi-Fi, bluetooth, infrared), cloud storage, etc.

4.2.3 *Online Collaboration System*

Since control and management of information is very crucial to the construction industry, online collaboration systems are increasingly being used to aid collaboration between geographically dispersed project team members. These web-based information management solutions store project information online so that

documents and correspondence are available in a single, shared environment that is secure and accessible to all authorized team members. This enables participants to view, track, share, and archive their information from any location, at any time, using a standard web-browser. The difference between using the traditional project communication versus communication using collaboration technology is illustrated in Fig. 1.

In practice, this means that all documents and drawings including feasibility studies, drawings, approvals, schedules, specifications, standards, procedures, etc, can be viewed online. Team members can add comments, issue notices, instructions and requests for information. Then documents can be published singly or in batches. When documents are superseded, revision numbers are updated meaning that everyone works on the most up-to-date, accurate and relevant information, with older revisions safely archived.

4.3 Communication Methods

4.3.1 *Verbal Communication*

Verbal communication is most common form of communication and most difficult to capture on permanent records and creates greatest opportunity for misunderstanding. The documented record of verbal communication should be concise and clear statement of what was said and positions expressed, without any attempt to embellish the conversation or draw unwarranted conclusions. In case the verbal communication is contractual in nature, it should be followed by a confirmed verbal instruction later in writing.

4.3.2 *Written Communication*

General written correspondence constitutes a large part of documentary record, handling of which requires great care. Incoming correspondence needs to be logged, read, distributed, acted upon and filed for retrieval as necessary.

Technical aspects for the written communication are:

a) Depending upon the criticality of the project, it must be planned and specified that replies or acknowledgement to incoming correspondence must be made within how many days.

b) A suspense file must be maintained at all times to ensure timely follow up action and to flag correspondence that is still pending action or requires follow up.

c) If the authorized signatory is absent; the designated deputy shall sign his/ her name and insert the word 'for' in front of authorized signatory name.

d) Every organization should have standards regarding using fonts including type, size, colour and the layout for all different types of documentation such as letters, minutes of meetings, internal memos, reports, etc.

4.3.3 *Electronic Communication*

There is an increasing use of E-mail and video communication for managing construction projects. In all organizations and for all projects, a project specific procedure is to be developed regarding use, handling of E-mail and printing of hard copies. As a general rule, all E-mails which contain key decisions, important information which has bearing on time, cost, quality and safety parameters or the documents which are critical to construction like RFIs, Submittals and drawings along
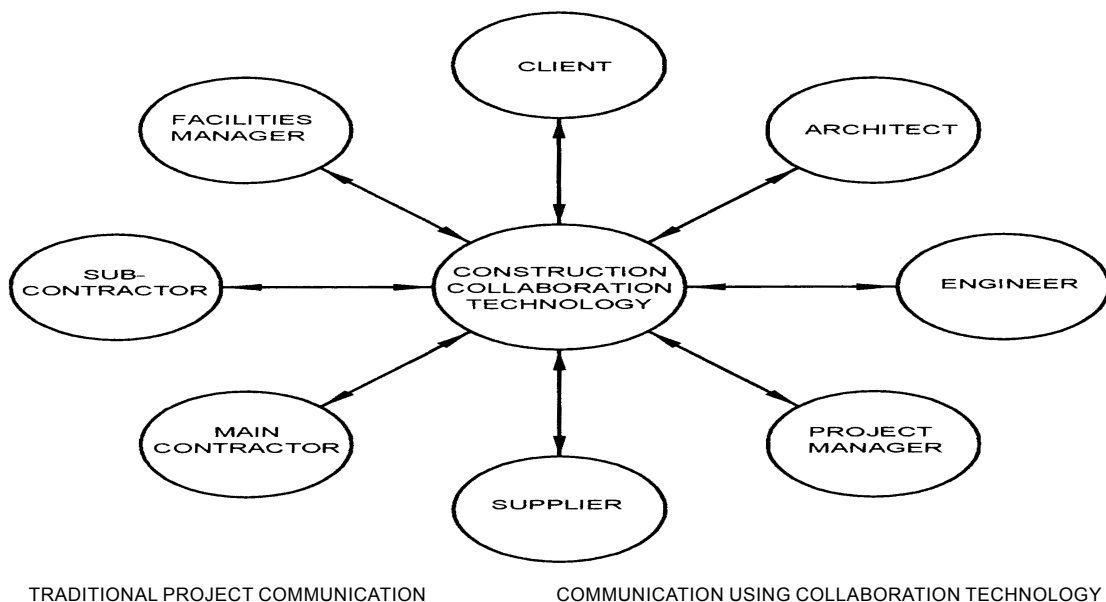

TRADITIONAL PROJECT COMMUNICATION   COMMUNICATION USING COLLABORATION TECHNOLOGY

Fig. 1 Traditional Project Communication *Versus* Communication Using Collaboration Technology

with any test reports, design reports, etc, shall be printed and retained in records in hard copy version.

Communication protocols need to be planned by the project management team and IT team at the start of the project. Every organization should have standards for E-mail communication regarding using fonts including type, size, colour, layout and e-mail signature.

4.3.4 *Online Collaboration*

4.3.4.1 Online collaboration systems in construction projects provide a uniform system of communication for multiple stakeholders and ensure that a common taxonomy is applied to documents and project processes. They help build effective work practices on projects by supporting each stakeholder to perform and be accountable for their contracted activities. They also encourage more effective project participation amongst all members of a project community. It can result in more effective data management with increased data integrity and better risk management by ensuring that projects run more securely, reliably and efficiently. In order to increase adoption, a platform should act as a neutral party where everyone on the project feels that the relevant project information is shared with the relevant project participants. An effective solution will support an entire project community and ensure that training is accessible, relevant and flexible to the needs of everyone on the project.

4.3.4.2 Benefits of collaboration systems can be summarised as,

   a)   reducing project costs;
   b)   facilitating execution of parallel activities;
   c)   reducing administration;
   d)   improving control;
   e)   reducing/deleting multiple entries;
   f)   increasing profit margins through better tracking; and
   g)   improving auditability.

4.3.4.3 The decision to adopt a project collaboration system and the system selection depends on,

   a)   the criticality of project;
   b)   expected benefits from adoption of collaboration system; and
   c)   IT capabilities in terms of skills and logistics availability of associating project participants.

4.3.4.4 A number of factors can affect the adoption of collaboration systems. These factors often occur concurrently and have differing levels of impact depending on the project context. Some of the challenges when implementing collaborative systems include,

   a)   unwillingness of some project participating organizations to adopt change;

   b)   internet speed at project site and head office locations;
   c)   internal network issues;
   d)   low computer skills and knowledge;
   e)   tight project timelines;
   f)   lack of defined project processes;
   g)   poorly defined accountabilities;
   h)   poor coordination between project team organizations;
   j)   lack of leadership;
   k)   geographical boundaries; and
   m)   external forces.

4.3.4.5 A collaboration system should provide the following functionalities and these should be the basis of any cost-benefit analysis:

   a)   A single point of access to real time information, for all project participants.

   b)   An efficient and effective system should send only a small amount of data to an individual user to provide him or her with access to project documentation. This removes the uncertainty and delay of distributing large packages *via* E-mail.

   c)   It should be an independent solution for all parties on the project, with defined access rights and automated control of documents and other information. Important document management functionalities are as follows:

      1)   Security, update and access tracking features for electronic documents and records, with automatic version control.

      2)   Protection of the integrity of documents through complete audit trails and the inability to remove documents or information from the system once distributed.

      3)   Incorporation of workflow, linking and collaboration in web-based environments.

   d)   Prompt and efficient transfer of documents and correspondence to archives.

   e)   System should be resilient and scalable to meet the size of the project without degradation of speed or reliability.

   f)   System should fully support accepted industry practices and provide access to accepted industry database.

   g)   A system with broader user base in the industry. This enables a system to streamline functionality and offer a larger client base for enabling client feedback and incorporating enhancements to its features.

h) System should have the capability for the average project user to be trained effectively.

4.4 Drawings and Documents

Documentation and communication between multiple parties are at the core of a construction or engineering project. Good management of written information can determine project cost, completion time, risk profile and financial success. It is important that the lead organizations (client / project-in-charge / project manager / architect) agree on basic communication protocols with the other participating organizations. These rules are sometimes known as a project hierarchy or communication matrix. Whatever the terminology used, each organization must understand its role and contractual obligations.

4.4.1 *Drawings*

Drawings can be categorised as conceptual design drawings, working drawings, good for construction drawings, shop drawings, as-built drawings, etc. Drawings play a crucial role in producing good quality construction. Therefore, careful attention must be paid as to how drawings are going to be created, checked and distributed. Some important points of consideration are:

a) Providing drawings and revised drawings to all agencies as early and as complete as possible at all relevant stages. At all stages of project, all agencies should be working with latest version of drawings.

b) Ensuring drawings are adequately detailed with adequate information and checked before site work starts.

c) Drawings nomenclature, colour coding, drawing size.

d) Storage of drawings at head office, site office.

4.4.2 *Documents*

a) Documents must have appropriate content and metadata. Metadata is the structured information that is used to identify a document's contents, location, physical attributes, type, for example text or image, map or model, and form, for example print copy or electronic file. Key metadata elements include,

1) the originator of a document;

2) the document title;

3) when the document was published;

4) where the document was published; and

5) the subject areas covered by the document.

b) Appropriate content and metadata provide confidence that,

1) the document structure, format and internal content will remain intact.

2) the context in which the document was created, used, transmitted and received will be apparent.

3) the links between items that make up a document are present.

c) Processes that project participants should agree on will include the following:

1) Document and mail types, attributes and disciplines,

2) Communication flows and matrices for mail and document transmittals,

3) Document registration metadata required,

4) Document naming and numbering conventions,

5) Document version and revision control,

6) Document formats and status,

7) Control of registration of documents,

8) Distribution of documents,

9) Workflows for submission of vendor documentation,

10) Finalization of project administrators, and

11) Other protocols (such as system requirements, training and support plans).

Although some of the decisions made can be quite detailed, agreeing on what constitutes good practice for a particular project is an important step in ensuring consistency in communication and information management.

4.4.3 *Communication Documents Specific to Construction Projects*

Documents form an important component of information for management of construction projects. Some communication documents specific to construction projects are daily progress report, monthly progress report, request for information/inspection (RFI), Transmittals of submission of drawings and specifications, test reports, project monitoring reports, etc.

Where included in the contract as part of scope of work, a diary must be maintained. However, even if it is not made mandatory by contract, it is the best practice to maintain this document, specifically at project site. The diary should record information on weather conditions, a broad factual summary of work, important issues or milestones, major events, meetings and major issues discussed and agreed or disagreed, visitors, client contacts, and observations on contractor's efforts, people and attitudes.

Diary should not include a record of discussions or actions concerning internal matters. The content of the diary should be limited to events of the project.

Some other specific documents are hindrance register, risk register, field change note, incident report, site order book, incoming and materials issue register, records of progress photographs, etc.

For all documents, specific formats should be developed with respect to project specific requirements and responsibility needs to be assigned to specific team members for maintaining each document. All these documents may become important in settling future claims of contractors/ vendors. In addition, these would provide important information at the time of writing the project closeout report.

4.5 Benefits of Effective Communication Management at Different Stages of Construction Projects

a) *Pre-construction stage*:

1) The client can communicate in a structured way with key consultants such as the design team, project manager, quantity surveyor, etc.

2) Large drawing files can be shared between participants in real time, leading to all consultants designing on latest version of drawings.

3) Changes and clarification in the scope of work are streamlined, as, instructions of the design team, other instructions and approved changes are documented and can be viewed, responded to and tracked.

4) This leads to uniformity of information in consolidated design drawings.

b) *Construction stage*:

1) Streamlining of the more frequent distribution of larger files.

2) Effective compilation and management of contract documentation and agreements of all contractors and vendors.

3) Effective management of contractor and vendor submissions, site and works inspections, approval of drawings, processing of claims and payments, defects management, and all other project documentation and correspondence.

4) Increased productivity between geographically dispersed teams and use of different time zones to an advantage for shifting work when the project schedule becomes tighter.

5) Effective cost management of project.

6) Reduced risk of errors and rework.

7) Off-site progress, quality and site security monitoring through site photographs clicked through web cameras and E-mailed or posted on collaboration platforms.

8) On-line meetings and video conferencing for meetings between organizations in dispersed geographic locations.

c) *Commissioning and handing over stage*:

1) Accurate development of as-built drawings and manuals.

2) Effective management of essential services certification.

3) Handover of documentation to the client and retention for ongoing facility management.

5 TEAM FOR CONSTRUCTION COMMUNICATION MANAGEMENT

Team structure within an organization for communication management is defined by the size, characteristics and criticality of a project. For small to medium size projects, planning for communication management could be conducted by the project-in-charge or project manager as applicable, but for large and critical projects, planning would be conducted by specialised strategic in-house team or through consultant(s). After planning for communication management, all project team members are responsible for making sure that communication between all stakeholders is managed as per the plan.

6 COMMUNICATION MANAGEMENT PLAN

6.1 Communication Requirements Analysis

6.1.1 The first step in communication management planning is 'communication requirements analysis' that generates the communication needs of all project stakeholders. For example, a communication requirement may specify the type of information and the format in which this information should be delivered. One of the purposes of communication requirements analysis is to optimize the use of resources in communication.

There is an inherent tendency towards complexity of communication on a project as the number of stakeholders goes up, and it is important for the project manager to limit that complexity by introducing a communication plan that gives enough information to stakeholders, but not so much that they are inundated by information that they may not necessarily need. That is why the communication needs of project participants or stakeholders need to be analysed to determine who gets what information, when and in which format.

6.1.2 Following types of information are needed to analyse the communication requirement for the project:

a) *Groups* — Different groups, disciplines, departments, and specialties involved in the project; for example, marketing, sales, and engineering as departments and structural engineers and MEP team as groups in the engineering department.

b) *Relationships* — Organizational charts can be helpful to assess some of the information related to organizational and stakeholder responsibility relationships. One of the human resource tools that can be adopted is a RACI chart, which stands for Responsible-Accountable-Consult-Inform, which answers the following questions with regards to different roles stakeholders play on various aspects of the project:

1) *Responsible* – Who will do the project work?

2) *Accountable* – Who will make the project decisions?

3) *Consult* – In case a decision needs to be made, who will be consulted?

4) *Inform* – In case a decision is made, who will be informed?

c) *Logistics* — Where are all stakeholders located and how each stakeholder is required to be connected for communication.

d) *Information needs* — To plan communication effectively, it's important to know the following information needs:

1) Internal information needs; for example, communication across the performing organization and communication within the project team.

2) External information needs; for example, communicating with regulatory authorities, contractors, consultants, media, public, etc.

3) Periodicity at which each information component is required.

4) Format in which each information component is required.

Based on communication needs, appropriate communication technology can be determined.

After conducting 'communication requirements analysis' it must be analysed that all identified information needs are correct, not in conflict with each other, and that they are precisely understood by all stakeholders. During analysis, the requirements must be decomposed into sufficient detail so that the project team can accurately estimate effort for implementation and assure that the requirements are indeed feasible. Annex A shows indicative format for 'communication requirements analysis'.

6.2 Assessment of Communication Technology and Management Aspects

Based on the communication needs established for all stakeholders, assessment needs to be conducted for adoption of following communication technology and management protocols.

6.2.1 *Interoperability Requirement*

It needs to be planned that software adopted by all specialised teams or consultants for preparation of drawings are interoperable, as the feature of automatic import / export of data is supported by interoperability of software.

Thus, a detailed system-to-system flow diagram needs to be designed to detail all data migration aspects of the project. Accordingly collaboration systems would be setup and decision would be taken regarding adoption of software for different functions by all project participants.

Interoperability can also encompass the ability for systems to be linked through identity and authentication protocols such as single sign on and two-step authentication. This enables organizations to control access through a corporate-level identity protocol such as integration through active directory. Promoting security at the corporate level enables trust in the project and project management system as well as ensures confidentiality of information.

This analysis along with 'communication requirements analysis' would lead to preparation of 'drawings/ documents information file' (*see* Annex A).

6.2.2 *Connectivity*

Project sites may be at remote locations and may have restriction of physical connectivity as well as infrastructure connectivity in terms of online connectivity. Also, project participants may be geographically dispersed. Thus, assessing this logistic situation, it needs to be planned that how the information needs of project participants would be addressed.

6.2.3 *Confidentiality of Information*

Effective communication between all project participants can be achieved by ensuring that the entire project community is able to contribute and collaborate on a secure, trusted, neutral project management platform. Some of the key elements are discussed below.

6.2.3.1 *Security management*

A critical element to building trust on any project is the ability to demonstrate that information exchanged between project participants is confidential. The establishment, implementation and review of an information security management system (ISMS) framework helps to oversee best practice for establishing, implementing, operating, monitoring, reviewing, maintaining, and improving an information management system. An ISMS is a systematic approach to managing sensitive project information so that it remains secure. It includes people, processes, and IT systems by applying a risk management process.

6.2.3.2 *Collaboration and neutrality*

Successful collaboration and communication on engineering and construction projects starts with a secure and trusted collaboration system. The primary deliverable of this type of system is the ability for participants to share information and to see the work of others when appropriate to doing their jobs effectively. In order to accomplish this, project participants need to feel that it is safe to share and collaborate on the system and that the system has the appropriate levels of security to protect sensitive information being exchanged.

In order to fulfil this type of function and to enable a truly trustworthy and effective platform for project collaboration, an online system can act as a neutral third party. Such neutral platforms can enable true collaboration by treating all organizations or agencies on the system equally.

6.2.3.3 *Security and access classification*

Security and access classification helps identify the rights of access and application of restrictions that apply to documents an organization creates or receives. It aims to protect information from unauthorized access, collection, use, disclosure, deletion, alteration and/or destruction.

When developing a security and access classification scheme the following issues should be considered:

a) Regulatory framework of the business.
b) Business function and activity of the business.
c) Risk assessment of impact of a breach relative to the nature of the document.
d) Any enforceable legal rights from corporate governance (external audits).
e) Freedom of information obligations.
f) Privacy protection.
g) Archival and legal process laws.

The scheme should include a defined user permissions register. This register lists the individuals from the organization and identifies the level of access permitted. It can be aligned with existing systems such as internal IT access levels, or created for a specific purpose. The level of user access can range from full access to read-only access. Five suggested access levels are:

1) *Project administrator access level* – Persons with this role are responsible for managing the way the project information is managed. Project administrators can make changes to project-wide rules and roles. These rules apply to all organizations working on the project.

2) *Organization access level* – Persons with this role are responsible for managing and assigning rules and user roles to people working in a particular associating organization.

3) *Document administrator access level* – Persons with this role are appointed to manage documents on a particular project for their own organization. By default, they are users who are made responsible for particular document control functions.

4) *User-full access level* – Persons with this role do not have administrator rights. They are those who create, edit, view, manage and search information and communicate with most persons in the project directory.

5) *User-read-only access level* – Persons with this role do not have administrator rights. They are those who view, manage and search communication and have access to project directory. However, they can neither create nor edit information or communication.

The scheme can be as simple or detailed as needed, depending on the size and complexity of the project and consideration of the likely impact on the business/project, if it is not managed appropriately. It is the duty of all to,

i) respect the nature of privileged or confidential information.

ii) understand what information can be classified as confidential.

iii) not use such information for personal gain.

iv) not share details of client projects with other clients without prior consent.

v) not discuss confidential information in public places or among colleagues.

vi) ensure all confidential written communication is filed safely and not left lying around at head office or site office.

vii) not make copies of confidential information

without prior consent and only with the intention of benefiting the company.

viii) password protect all online data at head office as well as at project sites. IT support for the same can be taken.

ix) not share E-mail password and data protecting passwords with anyone.

x) ensure all information pertaining to project is removed from project site office on completion of the project.

xi) take proactive action if they feel someone is knowingly or unknowingly divulging confidential information.

At communication management planning stage, systems need to be set for above aspects. This analysis would lead to preparation of 'Team Authorization Plan' as given in Annex A.

6.2.4 *System for Information/ Documents/ Drawings Retention and Archiving*

6.2.4.1 Each information component either drawing or document has a life cycle phase that covers its retention, destruction and transfer. When any information component is captured and registered, its disposition status and retention period needs to be decided. The removal of information from a system is a decision-making process and needs to be carefully managed to ensure required drawings and documents are not removed.

'Disposition process guides' are part of effective drawing/document control systems. Disposition systems manage the removal of drawings/documents from the operational document control system, based on established and approved process and procedures. The application of best practice in the area of governance, risk and compliance is a necessary part of maintaining corporate memory which determines rules for retaining records in order to meet national and international standards for records management.

Factors affecting decision for disposition include the following:

a) Contractual obligations.
b) Organizational requirements.
c) Legal or regulatory obligations.
d) Changes in work activity.
e) Changes to resourcing.
f) Life of the built assets.

6.2.4.2 Three disposition actions are discussed below:

a) *Continuing retention* — Continuing retention is the most common form of disposition action.

It involves preserving drawings/documents for their retention period and ensuring they remain retrievable and accessible. This may mean moving drawings/documents from the current environment of manual or computerised storage and storing them in another environment that assists long-term preservation. It is important that the drawings/documents maintain authenticity, reliability, integrity and usability over the entire retention period. Continuing retention strategies should include,

1) evaluating and selecting suitable technology especially for electronic documents.

2) ensuring drawing/document metadata remains accessible and usable for entire retention period.

3) including prompts to notify when drawings/documents need to be destroyed once the retention period has expired.

4) meeting obligations in agreements where external agencies are authorized to ensure that drawings/documents are appropriately safeguarded.

Web-based collaboration systems can fulfil requirements for retaining and archiving information in several ways including enabling triggers for review of documents for retention compliance and retaining information electronically. Their retention and archiving standards need to align with the specified standard for the project.

b) *Physical destruction* — Physical destruction may be conducted internally or externally and can include reformatting, overwriting, rewriting, deleting, shredding, burning and disposing in rubbish. Physical destruction of drawings/documents should always be authorized. The following rules should be followed in relation to physical destruction:

1) Drawings/documents relating to pending or actual litigation or investigation should not be destroyed.

2) Drawing/document destruction should be carried out in a manner that protects the confidentiality of any information it contains.

3) All copies of drawings/documents that are authorized for destruction, including security copies, preservation copies and backup copies, should be destroyed.

4) Maintain an audit trail of destroyed drawings/documents, if required.

5) For electronic drawings/documents to be destroyed there needs to be,

   i) a guarantee that the destruction actions cannot be reversed; and

   ii) a disposal schedule including destroying system pointers to the data using software, for example, links, especially when backups are reformatted or rewritten.

c) *Transfer of custody or ownership* – Transfer of custody or ownership does not occur frequently. The process requires the creator of the drawings/documents to identify relevant drawings/documents, remove them from the system and physically transfer them to another organization or business unit. The transfer may be made to the following:

   1) Other organizations with responsibilities for the drawings/documents.

   2) Outsourced or contractor organizations.

   3) Storage facility.

   4) Archive.

   It is important to ensure that the necessary accountabilities for the drawings/documents are presented to any external parties. Specific considerations relating to the transfer of ownership of electronic drawings/documents include,

   i) hardware and software compatibility;

   ii) metadata (control and contextual information);

   iii) data documentation (technical information on data processing and data structure);

   iv) patents and licensing agreements; and

   v) standards.

6.2.4.3 A 'Disposition Process Guide' should be developed to assist decision-making about disposition. It should provide guidelines about,

a) classes of drawings/documents;

b) retention periods;

c) which drawings/documents should be destroyed or captured; and

d) appropriate forms of disposition actions.

6.2.4.4 A 'Disposition Process Guide' can be of a more or less formal nature depending on the size and nature of the project and accountabilities of associating organizations. It can be developed in five stages:

a) *Stage 1 - Legal or administration requirements* — Evaluate any minimum retention periods demanded by legal or administration requirements. This would differ for different clients and projects.

b) *Stage 2 - Use of the drawings/documents* — Evaluate drawings/documents in the system to distinguish which are core and transactional. Core drawings/documents are those that are repeatedly used while transactional drawings/ documents are for multiple individual transactions that refer to the core drawings/ documents. For example, transmittals (transactional) and drawings (core). Understanding the relationship between core business documents and transactional documents helps to determine how long each are needed within the system.

c) *Stage 3 - Links to other systems* — Evaluate whether each drawing/document supports or is referenced by other drawings/documents or systems.

d) *Stage 4 - Broader range of uses* — Evaluate the broader uses of the document by,

   1) identifying other stakeholders who have an interest in the drawings/documents.

   2) assessing the risks associated with destroying the drawings/documents once internal use has finished.

   3) considering which actions are needed to preserve them to ensure business continuity in the event of loss or damage to the drawings/documents.

   4) assessing the financial, political, social or other positive gains from maintaining the drawings/documents after use has been completed.

   5) analyzing the costs and non-financial gains associated with drawing/document retention.

e) *Stage 5 - Allocate retention periods* — Evaluate the overall drawing/document control system and rationalize all drawings/ documents in the system. Group those with similar retention and disposition actions. Retention periods should be stated clearly and disposition triggers clearly identified against each drawing/document. Examples of these statements include 'destroy after x years after audit' or 'transfer to the archives x years after last transaction completed'.

The information from these five steps results in a 'Disposition Process Guide' that outlines disposition status, drawings/documents classes, disposition actions, triggers and retention periods.

6.2.5 *Data Security*

Retaining all information in secure and auditable format

10

is essential to a successful project. All information in a project collaboration system needs to be stamped with the date and time that cannot be deleted or altered. This information can then be filed in an 'Event Log' and should be able to be exported for archiving, reporting and retention purposes.

6.2.6 *Intellectual Property Rights Protection*

The system's IP is fundamental to specialized services which are delivered on a one-to-many basis (that is the same services are delivered to all clients across the globe, not as individual services provided on a one-to-one basis). Cloud or SaaS (Software as a Service) platforms use one-to-many basis in order that provides these services in a cost-effective manner. IP rights should be covered extensively in any terms of service agreement.

6.2.7 *Legal Validity of Soft Copies*

Any drawing/document that contains valuable information should be retained, irrespective of it being soft copy or hard copy. Such document should comply with statutory requirements; if any.

6.2.8 *Communication Protocols and Storage*

Communication protocols (like who writes to whom, who signs on outgoing memos/ correspondence, who prepares/ reviews/ uploads reports, who drafts/ reviews/ approves minutes, etc) should be established at the beginning of the project and should be adhered to in all respects. A 'Communication protocol format' specifically addressing the documentation matters should be developed for head office as well as project site and distributed to all concerned. All project related communication shall be kept in project files under the relevant project file number. Annex B shows a generic format for maintaining communication protocol information of a construction project. It can be customized for specific requirements of individual projects.

6.2.9 *Depository and Repository*

6.2.9.1 The system should provide a searchable data repository that represents both the final construction and the process that was used to construct. It can work as a depository retaining a copy of all live data during the course of the construction project. The repository must be constructed from the information captured within the system and must minimize the user's involvement in the creation of indices or other organizational tools (including keywords) needed to operate the archive. Following points should be considered while creating the repository:

   a) It should provide a means to improve control and compliance through QA and retention

standards as well as reducing the risk of loss of information.

   b) It should automatically generate archive documents quickly without much effort. System should have considerations relating to issues of security and confidentiality.

   c) Project records of each project need to be segregated from those for other projects and from general office documents.

   d) The project archiving solution should assist in avoiding laborious downloads and the time-consuming effort required to collate information and manage physical storage.

   e) The repository must provide retention, archiving, retrieval and transfer of all other records consistent with contractual, legal and registration requirements outlined in a format similar to Annex C.

6.2.9.2 The repository should be able to support the various document types that are created and captured during a construction project. Annex B provides an indicative list of documents that can be expected to be generated for a construction project. This list should be updated as per project requirements.

6.2.9.3 The repository must be able to handle the wide scope of items to be covered as well as it should be able to support the digital representation of those items (that is the various media formats). It is essential for any repository system to cover the breadth of these file types, given that each may contain information that is only referenced in that specific type of file.

6.2.9.4 The repository must support all the formats and document types that would be a necessary requirement/ criteria for successful implementation of a digital library.

6.2.9.5 The repository must have the ability to provide a copy of all live and archived data, a current copy of the applications, customizations, interfaces and system documentation either during or upon expiration of the project. Such data should be in a readable format.

6.2.9.6 Project information must be able to be accessed through either an online or offline repository. An online project repository should provide access to project information and correspondence held on the collaboration platform securely in the cloud, with no restrictions on size limit. The project repository should provide,

   a) data security and redundancy.

   b) secure from anywhere at anytime.

   c) available for multiple projects, allowing multiple user access.

6.2.9.7 An online repository should store data on servers located geographically far away. These servers

would serve as a second location of data storage, ensuring a disaster recovery and backup plan is in place to protect against loss of information.

6.2.9.8 Alternatively, the project information can be a built on-premise repository, during the course of the project or an offline, read only installation at the end of the project. The offline project repository should have the following functionality:

a) Repository size suitable for storing project information,

b) Browser interface,

c) Full and accurate metadata for every mail and document record,

d) Captures the data available to an individual user (including confidential),

e) Flexibility in running specific repository for just mail or documents and also by defined time period,

f) Full thread capability for all mails,

g) Can be installed on a local server to allow access to multiple users,

h) Easily browse between multiple different repositories from the same interface, and

j) Can be password protected to prevent unauthorized access to the repository.

6.2.10 *Evaluation for Adoption of an Online Project Collaboration System*

Assessing the project nature, size and criticality, it needs to be assessed whether web based or online project collaboration system needs to be adopted and what level of collaboration needs to be adopted. It can be assessed in following steps:

a) *Step 1* — Conduct project analysis for each of the defining parameters as shown in Table 1.

b) *Step 2* — Prepare 'collaboration matrix'. Assess the potential level of collaboration for each identified issue, to help determine the overall level of collaboration required for a

Table 1 Parameters for Conducting Analysis for Online Collaboration System

(*Clause* 6.2.10)

Sl No. (1)	Class (2)	Objectives (3)	Examples of Parameters (4)
i)	Attitude	Determine the attitudes and sentiment of the users and management teams towards collaboration solutions on the project	a) User resistance/willingness towards collaboration on the project b) Management support to drive collaboration c) Type of management support - passive or active
ii)	Competency	Determine the competency levels of the project participants involved	a) Level of end-user computer skills and knowledge b) Prior experience with collaboration c) Level of competency in use of the collaboration tool
iii)	Commercial	Determine the nature of the commercial arrangements between project participants involved	a) Contractual arrangements between participants b) Specific clauses in contracts that affect the use of collaboration among participants
iv)	Environment	Determine the type of environment the project teams are operating in	a) Centralized or decentralized document control function b) Fragmented document control system c) Cultural diversity in project team
v)	Infrastructure	Determine the potential impact the infrastructure may have on the collaboration experience	a) Internet access and reliability of service b) Quality of computer systems c) Firewalls
vi)	Process and procedural	Determine the specific requirements the process or procedure require	a) Defined or undefined processes and procedures b) Level of standardization c) Communication d) Roles and responsibilities e) Types of documents, for example hard copy or electronic, manual handle or automated f) Reporting requirements g) Review and evaluation policies h) Delegation of authority
vii)	Project complexity	Determine the scope and factors that influence the overall complexity	Scope and factors that influence the overall complexity
viii)	Regulatory/ legal	Determine the nature of the legal and regulatory framework that the project is operating within	a) Legal or regulatory position on electronic documents b) Document retention obligations

project. Format for determining level of collaboration required for different project functions and different levels of collaboration are as shown in Annex D.

6.2.11 *Cost of Technology Adoption and Cost-Benefit Analysis*

Adoption of IT systems and structured management systems would add to the cost of the project, but would also provide benefits in terms of successful delivery of projects. Thus a cost-benefit analysis needs to be conducted to finalize upon the system adoption that would be sustainable with respect to benefits that would be accrued. This analysis would lead to preparation of 'cost-benefit analysis report / budget for adoption of communication management plan' and 'system description plan' for the IT system to be adopted.

6.2.12 *Adherence to 'The Information Technology Act'*

For the transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as 'Electronic Commerce', which involves the use of alternatives to paper based methods of communication and storage of information, '*The Information Technology Act, 2000*' and rules/regulations framed thereunder shall be complied with.

6.3 System Finalization

After preparation of 'Communication Requirement Analysis' and assessment of above parameters, the lead organization needs to finalize the technology and management system that would be adopted by all participating organizations for information creation, transfer, storage and future retrieval that is communication management. The lead organization may evaluate the feasibility of using a system on an individual critical project, on multiple projects as best practice or as a standard enterprise solution on all projects. Licensing models for technology need to consider the project requirements, numbers and types of users, need or desire for customization and integration, and ability to scale. Annex A lists all documents that may be prepared during 'plan communication management' stage.

7 IMPLEMENTATION OF COMMUNICATION MANAGEMENT PLAN

7.1 Establishing Systems

Systems need to be setup for facilitating communication management as per the 'communication management plan' prepared. This requires,

a) finalizing contractual clauses for all tenders and agreements that would define uniform communication management systems adoption by all project team organizations.

b) assessment of hardware, software, systems and processes of lead organization and identified associating organizations for adoption of planned system.

c) planning for staff training and systems upgradation for adoption of planned system. This would include planning with respect to time required, associated cost, staff availability for trainings and training programs, conducted in-house or outsourced to specialist consultants.

As far as internal communication within project team is concerned, project-in-charge or project manager should be the focal point for all information on the project and should be the single point of contact for consultant, contractor and client. All team members should endeavor to break any communication barriers within the team. Project manager may designate a few key individuals to manage specific tasks, who in turn will become nodal points for the information on that specific task.

7.2 Managing Drawings, Documents and Meetings

Best practices need to be established for storage of drawings/documents, record keeping and monitoring their receipt and conduct of meetings.

7.2.1 *Drawings and Documents*

Following actions should be taken for handling drawing and documents:

a) A copy of the drawings and documents received shall be stored both at head office and project site office for records and reference. 'Receipt register' shall be maintained at both the locations as a record for the drawings received.

b) Transcripts for the hard copy drawings received shall be maintained in the 'Receipt register'.

c) For the drawings received online, the sending agencies shall be required to E-mail a scanned copy of the signed transcripts which shall be maintained in the 'Receipt register'.

d) Drawings and documents shall be stored in the chronological order for later records and reference. A system needs to be planned to avoid inadvertent use of superseded drawings and documents by project team members.

e) Changes in drawings or changes in specifications and other documents made by different agencies shall be accepted at site only in the written form.

f) Project site office shall update the soft copy drawing records periodically for the preparation of 'As built drawings', which would be submitted at the stage of handing over.

g) A copy of all the documents received at site shall be forwarded by the project site office to the head-office for records and reference.

h) If drawings or documents are not received on time, the project-in-charge or project manager shall pursue with the concerned agency and if required it shall be intimated to the Head-office and the matter shall be pursued by the project team at the head office.

j) If there is delay in receiving the drawings or documents, the matter shall be included in the reports and agenda of forthcoming meetings.

Annex E shows an indicative table for maintaining receipt records of drawings or documents.

7.2.2 *Meetings*

7.2.2.1 Meetings, physical or virtual, between project participating organizations would be required for project work coordination. Till pre-construction stage of the project, these meetings would be conducted at head office, but from construction stage of the project, these meetings may be conducted at project site. Meetings could be categorised as following types:

a) Pre-start or project 'kick off' meeting.
b) Periodic meetings at specified intervals.
c) Emergency meetings at short notice.

7.2.2.2 *Meeting administration*

a) Agenda for all the meetings should be circulated to the concerned agencies sufficiently in advance. It would include new issues and pending issues from the previous meeting. This will help in effective usage of time and would lead to increased participation by the agencies.

b) Each participating organization should be informed about the time at which their presence is required. This would improve the attendance at meetings.

c) Minutes of the meetings shall be promptly prepared and circulated to the concerned agencies.

Annex A shows the documents that may be prepared at this stage.

8 MONITORING OF COMMUNICATION

The communication plan adoption should ideally be initiated from the pre-construction stage of the project.

All organizations, vendors who get associated with the project at different stages of the project, should be contractually bound to adopt the 'communication management plan' as applicable and protocols established for it.

8.1 Communication Management Audit

8.1.1 Periodically audit needs to be conducted to assess the efficacy of planned systems. Points to be considered are as follows:

a) Depending upon the criticality and duration of the project, audit may be conducted on quarterly, half-yearly or annual basis.

b) Audit may be conducted by the in-house team of the lead organization or by a third party specialist consultant.

c) Audit would be conducted at head office as well as at project site.

d) Audit would be conducted for all information components.

e) It would audit,

   1) information generation, retention, transfer and archiving.

   2) timely actions for above components.

   3) issues that may have originated due to delayed, incomplete, inaccurate or missing information. For this 'Issues Log' would be audited.

   4) impact on project in terms of disputes and project parameters of time, cost and quality due to delayed, incomplete, inaccurate or missing information.

   5) points raised in previous audit and their associated preventive/rectification actions

'Communication management audit' would be planned and structured earlier in 'plan communication management' stage and would be part of planning. Deliverable of this action would be 'communication management audit report'.

8.1.2 Audit results and reporting would lead to following action/status:

a) Communication management plan updation.

b) Interaction with team members regarding non-conformance of plan and understating reasons for it.

c) If required, re-training of staff and systems and processes updation.

8.2 Communication Management Plan Updation

Communication management plan updation needs to be authorized by the project-in-charge or project

manager and lead organization. It would follow the same steps as in 'Plan communication management'. Updated plan should be within the contractual arrangement for the project and should be communicated to all project team agencies. They should be given sufficient time to update their respective systems for adoption of updated plan.

Annex A shows the documents that may be prepared at 'Monitor and Control Communication' stage.

9 POST CONSTRUCTION REVIEW AND DOCUMENTATION

At project close out stage following actions shall be taken:

a) All project communication shall be collated and archived in repositories (as given in **6.2.9**) for future reference.

b) Post construction communication management audit shall be conducted.

c) Project completion/closure report including lessons learnt shall be documented as part of knowledge management.

ANNEX A

(*Clauses* 6.1.2, 6.2.1, 6.2.3.3, 6.3, 7.2.2.2 *and* 8.2)

DOCUMENTS TO BE PREPARED AT DIFFERENT STAGES

A-1 AT 'PLAN COMMUNICATION MANAGEMENT' STAGE

a) Communication requirement analysis:

Stage of Project	Drawing/Document Name	Agency 1	Agency 2	Agency n
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s
		p - s	p - s	p - s

p – For reference for further work.
q – For information.
r – For approval.
s – Not required.

b) Drawings/Documents information file:

Drawing/ Document	ID	Content	Created by	Software to be Used	Import/ Export Information to Drawing / Document	Periodicity of Updation	Filing Information

c) Team authorization information:
1) Project administrator access — Designated person
2) Organization level access

Name of Person with 'Organization level access'	Organization 1	Organization 2	Organization 3	Organization n

3) Document level access in the organization.

Drawing/ Document	ID	Authorized Team member 1	Authorized Team member 2	Authorized Team member 3	Authorized Team member n
		x - z	x - z	x - z	x - z
		x - z	x - z	x - z	x - z
		x - z	x − z	x - z	x - z
		x - z	x - z	x - z	x - z
		x - z	x - z	x - z	x - z
		x - z	x - z	x - z	x - z

x - Document administrator access level
y - User full-access level
z - User read-only access level

c) Disposition process guide
d) Communication protocols
e) Collaboration matrix
f) Cost-Benefit analysis report / Budget for adoption of communication management plan
g) System description plan

A-2 AT 'ORGANIZE AND MANAGE COMMUNICATION' STAGE

a) System evaluation report,
b) System upgradation plan;

1) Skills upgradation plan for team members,
2) Processes planning plan,
3) IT systems upgradation plan,
c) Best practices for managing drawings,
d) Best practices for managing documents, and
e) Best practices for organizing and managing meetings.

A-3 AT 'MONITOR AND CONTROL COMMUNICATION' STAGE

a) Communication management audit report,
b) Updated communication management plan, and
c) Updated system upgradation plan.

ANNEX B

(*Clauses* 6.2.8 *and* 6.2.9.2)

GENERIC FORMAT FOR MAINTAINING COMMUNICATION PROTOCOL INFORMATION OF A CONSTRUCTION PROJECT

Project Stage	Client		PMC		Consultant	
	To	Cc	To	Cc	To	Cc
A — DESIGN						
A1 — Design Development						
Layouts						
Services design layouts						
User requirements and utility inputs						
Overall design specifications						
Utility specifications						
Samples and finishes						
MOM — Design review						
A2 — Sign-off						
Layouts/ Details						
Samples and finishes						
Services design						
Final tender drawings and specifications						
B — TENDER						
Budget and cost estimates						
Procurement and purchase requests						
Tender documents						
Comparative statements						
LOI/ PO						
C — CONSTUCTION						
C1 — Reports						
Project weekly reports						
Project monthly report						
Project schedule						
Order control tracking sheets						
Cost reports						
Safety statistics report						
Reports on pending drawings/ RFIS and submittals						
C2 — Minutes of Meeting						
Developer review meeting						

(*Continued*)

ANNEX B

(*Clauses* 6.2.8 *and* 6.2.9.2)

(*Concluded*)

Project Stage	Client		PMC		Consultant	
	To	Cc	To	Cc	To	Cc
Weekly progress review meeting						
Schedule review meetings						
Coordination meetings						
Weekly safety meetings						
Developer review meeting						
C3 — Construction Documentation						
RFI (Request for Information)						
NCR (Non-conformance report)						
Submittals						
Revisions to GFC drawings						
Change authorization request						
Change order/ Contract amendment						
Quality reports/ Checklists						
D — CLOSEOUT						
Snag lists						
As-built drawings and handing over documents						

ANNEX C

(*Clause* 6.2.9.1)

PROJECT DOCUMENTATION RETENTION PERIODS

C-1 The retention period needs to be added as per prevailing law and terms of contract. This may be followed by a secondary process to select records for a historical archive.

Document Type	Retention Period
All business organization documents partnership agreements, articles of incorporation, bye-laws, annual meeting minutes, etc	
Accounting/Financial records Statements, checks, time sheets, expense reports, payroll, SSR	
Accounts receivable/payable, income tax returns	
Project records, proposals, job selection correspondence	
Permits and approvals and sign-off	
Final bid and final construction documents	
Presentations, models, and renderings	
Construction contracts	
Drawing and specifications, preliminary design and sketches	
Job photos, slides, videos	
Reports on onsite observations that is health and safety	
Feasibility, schematic design, design development sets	
Records of change	
Testing and commissioning documents	
As-built or record drawings	
Project E-mail	
Correspondence, meeting minutes, letters/memos, progress reports between all contract parties	

ANNEX D

(*Clause* 6.2.10)

LEVELS OF WEB – BASED COLLABORATION BETWEEN PROJECT TEAM ORGANIZATIONS

D-1 Each organization or project may adopt a collaboration solution that provides an appropriate mix of system features and functionality as given below:

Level (1)	Characteristics (2)	Suitability Profile (3)
Level 1	a) Uses the basic features and functionality to manage project documents b) Used mainly as an EDMS providing an electronic register and distribution between organizations. c) Internal handling of documents is manual	a) Limited experience among participants to drive use of system b) Strong requirement for manual information management c) Infrastructure and support is not reliable
Level 2	a) Uses basic and some advanced system features and functionality b) Used as the primary medium across whole project to manage project information c) Main project processes are mapped into the system providing increased automation and electronic documents management for project	a) Participants motivated and driven to use system b) Mix of advanced and basic system competency c) Some requirement for manual information management exists d) Desire to introduce innovation and automation for key inter-organizational processes e) Infrastructure and support is reliable
Level 3	a) Uses many advanced features and functionality of system to manage project information b) Used as the only medium across project to manage project information c) Majority of project processes are re-engineered into system to provide maximum automation and electronic documents management for project	a) Majority of participants have advanced competency in system b) Strong requirement to manage information digitally over manual c) Infrastructure and support is reliable

D-2 EVALUATION TOOL

Evaluation tools that guide decisions about required levels of collaboration on a project or organization are available. Basic evaluation criteria will take into consideration the scope and desired outcomes of the project but most collaboration systems should include the following at a minimum:

1) Access control functionality.
2) Document management.
3) Audit trail / permanent project record.
4) Storage capability (unlimited file storage).
5) User capacity (unlimited users).
6) Compliance to standards.
7) Solution availability.
8) Cloud or SAAS provider.
9) Archive capability.
10) Security (encryption, disaster recovery, reliability).
11) Intuitive user interface.
12) Data retrieval capability (search, extract, discover information).
13) Reporting capability.
14) Correspondence management.
15) Third party system integration.
16) Collaboration (red-line/markup/comment).
17) Workflows capability.
18) File type capacity (ability to view, distribute, many types of files).
19) BIM process capability.
20) Mobile access.
21) Field management.
22) Handover/O&M capability.

D-3 INDICATIVE FORMAT FOR DETERMINING LEVEL OF COLLABORATION REQUIRED FOR DIFFERENT PROJECT FUNCTIONS

Issue	Comments	Potential Level of Collaboration – 1, 2 or 3
a) Management support		
b) Team members' willingness to adopt change		
c) Team members' experience with collaboration systems		
d) Requirement for manual information management		
e) Requirement for digital information management		
f) Reliability of infrastructure and support, for example internet speed		
g) Internal network capacity		
h) Computer skills and knowledge		
j) Project timelines		
k) Project processes		
m) Level of defined accountabilities		
n) Level of coordination between project teams		
p) Geographical/location issues		
q) Other issues		

ANNEX E

(*Clause* 7.2.1)

FORMAT FOR MAINTAINING RECEIPT RECORDS FOR DRAWINGS AND DOCUMENTS

Drawing/ Document Details			Date of Receipt	Mode of Receipt		Received at		Transcript Received	
Drawing No.	Document Name	Version		Hard copy	E-mail	Office	Site	Yes	No

ANNEX F

(Foreword)

COMMITTEE COMPOSITION

Construction Management (Including Safety in Construction) Sectional Committee, CED 29

Organization	*Representative(s)*
In Personal Capacity (*102, Sraddha Temple Tree, Rustom Bagh, Old Airport Road, Bengaluru*)	SHRI P. KRISHNAN (**Chairman**)
Aecom India Private Limited, Noida	SHRI PAWAN JAIPURIYAR SHRI ARVIND AGARWAL (*Alternate*)
Airports Authority of India, New Delhi	SHRI PRADEEP KUMAR SHRI S. SREEKUMAR (*Alternate*)
Builders' Association of India, Mumbai	SHRI H. S. PASRICHA SHRI SANJAY SONI (*Alternate*)
Building Materials and Technology Promotion Council, New Delhi	DR SHAILESH KUMAR AGRAWAL SHRI PANKAJ GUPTA (*Alternate*)
CSIR — Central Building Research Institute, Roorkee	DR ACHAL K. MITTAL SHRI AJAY CHAURASIA (*Alternate*)
Central Public Works Department, New Delhi	SHRI M. K. SHARMA SHRI SANJEEV RASTOGI (*Alternate*)
Construction Industry Development Council, New Delhi	SHRI P. R. SWARUP SHRI O. P. GUPTA (*Alternate*)
Construction Skill Development Council, New Delhi	COL (RETD) ANIL KUMAR POKHRIYAL
Creative Design Consultants and Engineers (P) Ltd, Ghaziabad	SHRI AMAN DEEP
Cushman & Wakefield India Pvt Ltd, Gurugram	SHRI HARLEEN OBEROI
Delhi Development Authority, New Delhi	ENGINEER MEMBER CHIEF ENGINEER (DESIGN) (*Alternate*)
Delhi Metro Rail Corporation, New Delhi	SHRI DALJEET SINGH SHRI PRAMIT KUMAR GARG (*Alternate*)
Delhi Tourism and Transportation Development Corporation, New Delhi	SHRI SHISHIR BANSAL
EH and S Cares, New Delhi	SHRI A. K. TRIPATHI
Engineers India Limited, New Delhi	SHRI T. K. SEN SHRI S. N. BHATNAGAR (*Alternate*)
Hindustan Construction Company Limited, New Delhi	SHRI AVINASH HARDE SHRI RAJENDRA SAHANI (*Alternate*)
Hindustan Prefab Limited, New Delhi	CHAIRMAN AND MANAGING DIRECTOR SHRI S. K. JAIN (*Alternate*)
Indian Buildings Congress, New Delhi	SHRI DEEPAK NARAYAN
Indian Institute of Technology, New Delhi	DR K. C. IYER DR K. N. JHA (*Alternate* I) DR J. UMA MAHESHWARI (*Alternate* II)
Kaleidoscope, New Delhi	SHRI AMOR KOOL
Larsen and Toubro Limited, Chennai	SHRI M. P. NAIDU SHRI R. SHANKAR NARAYANAN (*Alternate*)
M.N. Dastur and Company (P) Limited, Kolkata	SHRI S. K. GUHA SHRI GOBINDA PAL CHOUDHURY (*Alternate*)
Military Engineer Services, Engineer-in-Chief's Branch, Army Headquarters, New Delhi	BRIG MANOJ KUMAR COL M. K. PRASAD (*Alternate*)
Ministry of Statistics and Programme Implementation, New Delhi	DR DEVENDRA VERMA DR D. SAI BABA (*Alternate*)
National Buildings Construction Corporation Limited, New Delhi	SHRI HEM RAJ SHRI H. K. DHAWAN (*Alternate*)

Organization	Representative(s)
National Institute of Construction Management and Research, Mumbai	DR ANIL AGARWAL DR ARUN CHANDRAMOHAN (*Alternate*)
NTPC Ltd, New Delhi	SHRI ANIL KAPOOR
NITI Aayog, New Delhi	SHRI SHATRUGHAN LAL SHRI SANJAY KUMAR (*Alternate*)
PMI Organization Centre Pvt Ltd, Mumbai	SHRIMATI LEENA GUPTE SAMANT SHRI TEJAS SURA (*Alternate*)
RITES Ltd, Gurugram	SHRI PAWAN CHOUDHARY SHRI M. D. JOSHI (*Alternate*)
School of Planning and Architecture, New Delhi	DR V. K. PAUL
Shelter Consulting Engineers, Noida	SHRI MANOJ KUMAR MITTAL
The Institution of Engineers (India), Kolkata	SHRI S. A. REDDI SHRI Bipin Chand (*Alternate*)
In personal capacity (*204, Sector A, Pocket-C, Vasant Kunj, New Delhi*)	DR VANITA AHUJA
In personal capacity (*411, Technology Apartments, Patparganj, Delhi*)	SHRI R. P. LAHIRI
In personal capacity (*7A, Autumn Hue, Seasons, PPD Apartments, Kuravankonam, Kowdiar, Thiruvanthapuram*)	SHRI JOSE KURIAN
In personal capacity (*411, Sector A, Pocket-C,Vasant Kunj, New Delhi*)	SHRI KRISHNA KANT
In personal capacity (*Flat No. 125, Ankur Apartments, Patparganj, Delhi*)	SHRI A. K. SHARMA
In personal capacity (*Flat No. 220, Ankur Apartments, Patparganj, Delhi*)	DR V. THIRUVENGADAM
BIS Directorate General	SHRI SANJAY PANT, Scientist 'F' and Head (Civil Engg) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI ABHISHEK PAL
Scientist 'B' (Civil Engg), BIS

Panel for Construction Project Management, CED 29/P1

Organization	Representative(s)
In Personal Capacity (*102, Sraddha Temple Tree, Rustom Bagh, Old Airport Road, Bengaluru*)	SHRI P. KRISHNAN (**Convener**)
Central Public Works Department, New Delhi	SHRI M. K. SHARMA SHRI SANJEEV RASTOGI (*Alternate*)
Creative Design Consultants and Engineers (P) Ltd, Ghaziabad	SHRI AMAN DEEP
Delhi Tourism and Transportation Development Corporation, New Delhi	SHRI SHISHIR BANSAL
EH and S Cares, New Delhi	SHRI A. K. TRIPATHI
Engineers India Limited, New Delhi	SHRI A. K. MISHRA SHRI D. JANA (*Alternate*)
Indian Institute of Technology, New Delhi	DR K. C. IYER
Larsen and Toubro Ltd, Chennai	SHRI M. P. NAIDU SHRI R. SHANKAR NARAYANAN (*Alternate*)
NTPC Ltd, New Delhi	SHRI SATISH UPADHYAY SHRI AMIT TRIVEDI (*Alternate*)
School of Planning and Architecture, New Delhi	DR V. K. PAUL
Shelter Consulting Engineers, Noida	SHRI MANOJ KUMAR MITTAL
In personal capacity (*204, Sector A, Pocket-C,Vasant Kunj, New Delhi*)	DR VANITA AHUJA

Organization	*Representative(s)*
In personal capacity (*E-9, Gaur Green Avenue, Abhay Khand-II, Indirapuram, Ghaziabad*)	Shri Iftikhar A. Drabu
In personal capacity (*C-2/2324,Vasant Kunj, New Delhi*)	Shri Chandra Pal
In personal capacity (*411, Sector A, Pocket-C, Vasant Kunj, New Delhi*)	Shri Krishna Kant
In personal capacity (*608, Technology Apartment, I.P. Extension, Delhi*)	Dr S. N. Mandal
In personal capacity (*Flat No. 125, Ankur Apartments, Patparganj, Delhi*)	Shri A. K. Sharma
In personal capacity (*Flat No. 220, Ankur Apartments, Patparganj, Delhi*)	Dr V. Thiruvengadam
In personal capacity (*7A, Autumn Hue, Seasons, PPD Apartments, Kuravankonam, Kowdiar, Thiruvanthpuram*)	Shri Jose Kurian

Working Group on Communication Management, CED 29/P1/WG 9

Organization	*Representative(s)*
In personal capacity (*204, Sector A, Pocket-C,Vasant Kunj, New Delhi*)	Dr Vanita Ahuja (***Convener***)
Aconex India, Noida	Shri Rohit Nigam
Cushman & Wakefield India Pvt Ltd, Gurugram	Shri Harleen Oberoi
IRCON International Ltd, New Delhi	Shri Hitesh Khanna
Technovate Solutions, New Delhi	Shri H. L. Chawla

This standard (Part 9), communication management has been formulated with the aim to provide guidelines for communication management of construction projects in all stages. Successful planning and execution of a project is dependent on effective communication management planning and its implementation. This standard is intended to cover aspects on communication management as part of construction project management and information regarding the applicable tools and techniques. It gives guidelines on planning the communication management, organizing and managing communication and monitoring and controlling communication as part of the communication management process. Users of this standard are encouraged to employ suitable communication management techniques and technologies as an aid to implement provisions of this standard.

The guidelines may be applicable in general to all construction projects. However, for smaller projects, the applicability of various provisions may be decided appropriately by the parties concerned.

The composition of the Committee responsible for formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: CED 29 (10729).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected