МИНОБРНАУКИ РОССИИ

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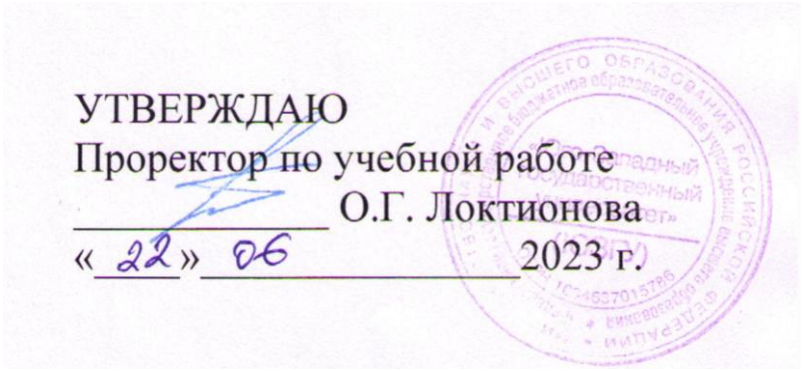
Кафедра иностранных языков



BASICS OF CONCEPT ANALYSIS OF CONSTRUCTION ENGINEERING AND ARCHITECTURE TEXTS

Методические рекомендации для самостоятельной работы
по дисциплине «Иностранный язык»
для обучающихся на факультете строительства и архитектуры
по направлениям подготовки: 07.03.01, 07.03.04, 08.03.01,
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Basics of Concept Analysis of Construction Engineering and Architecture Texts : методические рекомендации для самостоятельной работы по дисциплине «Иностранный язык» для обучающихся на факультете строительства и архитектуры по направлениям подготовки: 07.03.01, 07.03.04, 08.03.01, 13.03.01, 21.03.02, 08.05.01, 08.05.02, 21.05.04 / Юго-Зап. гос. ун-т; сост.: В.В. Махова, О.Н. Занина. – Курск, 2023. – 70 с.:– Библиогр.: с. 70.

Методические рекомендации «Basics of Concept Analysis of Construction Engineering and Architecture Texts» содержат комплекс заданий и упражнений, способствующий формированию базовых коммуникативных и языковых компетенций, а также компетенций, способствующих активному вхождению обучающихся в сферу их профессиональной деятельности. Методические рекомендации соответствуют требованиям ФГОС ВО.

Предназначены обучающимся по следующим направлениям подготовки: 07.03.01, 07.03.04, 08.03.01, 13.03.01, 21.03.02, 08.05.01, 08.05.02, 21.05.04 для самостоятельной работы с целью освоения дисциплины «Иностранный язык».

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ВВЕДЕНИЕ

Изучение иностранного языка является одним из основных элементов системы профессиональной подготовки специалистов в высших учебных заведениях. Владение иностранным языком необходимо, чтобы выпускник вуза мог стать конкурентоспособной личностью на рынке труда. В условиях реализации компетентностного подхода в образовании это предполагает профессионально ориентированную направленность обучения путем осуществления тесной связи изучаемого материала с выбранной специальностью обучающегося, с предметами междисциплинарного курса и производственной практикой.

Цель дисциплины – формирование достаточного уровня иноязычной коммуникативной компетенции для эффективной профессиональной деятельности.

Основной целью дисциплины является повышение исходного уровня владения иностранным языком, достигнутого на предыдущей ступени образования, формирование профессионально значимых иноязычных речевых умений у бакалавров, овладение бакалаврами необходимым и достаточным уровнем иноязычной коммуникативной компетенции для решения социально-коммуникативной задач в культурной, научной и профессиональной сферах деятельности, при деловом общении с зарубежными партнерами, а также для дальнейшего самообразования.

Процесс изучения дисциплины направлен на формирование компетенции УК-4 – Способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах).

МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ

Самостоятельная работа студентов направлена на закрепление пройденного материала, формирование умений и навыков быстро решать поставленные задачи. Она предполагает не пассивное «поглощение» готовой информации, а ее поиск и творческое усвоение. Самостоятельная работа по своей сути предполагает

максимальную активность каждого обучающегося. Она проявляется и в организации работы, и в использовании целенаправленного восприятия, переработки, закрепления, применения знаний.

Формирование иноязычной компетентности студентов реализуется с опорой на компетентностный, системный и контекстный подходы. Использование данных подходов способствует оптимизации учебного процесса и формированию устойчивой мотивации Используемая методология смыслового анализа и моделирования научного текста имеет аналитико-синтетический характер и позволяет прорабатывать текст, проходя от поверхностной (синтаксической) структуры текста к его глубинной (семантической) структуре. При использовании метода обучающиеся начинают проводить анализ текста с определения его функционально-стилевой принадлежности и принадлежности к определенному типу речи, что облегчает понимание целевого замысла текста. Далее проводится смысловой анализ каждого выделенного фрагмента по принадлежности к определенному типу речи. Обучение смысловому анализу и моделированию научного текста осуществляется в соответствии со следующей стратегией: обучаемым предлагается выбрать соответствующую тексту когнитивную «схему» из предложенных (описание научного открытия, описание технологического процесса и т.д.). Когнитивные «схемы» содержат конечное число смысловых элементов. Формирование стратегий, необходимых для реализации вышеприведенной процедуры, следует осуществлять в ходе специально организованного этапа обучения. Чтобы не затруднять деятельность обучаемых, на данном этапе обучения применяются небольшие однородные по стилю тексты, которым соответствует одна когнитивная «схема». В ходе обучения, согласно методологии и стратегиям смыслового анализа и моделирования, знания по грамматике английского языка активизируются непосредственно при чтении текста, неоднократно повторяемая в ходе анализа специальная лексика способствует формированию профессионального тезауруса, развивается языковая и профессиональная компетенции. Студенты имеют четкие стратегии деятельности, связанные с обработкой информации, развивается текстовая компетенция. Синтетические действия, направленные на

свертку текста и требующие от обучаемых трансформации высказываний, соответствуют уровню предпереводческого анализа и таким образом способствуют развитию переводческой компетенции. Активное взаимодействие с текстом развивает коммуникативную компетенцию. Таким образом, введение специального этапа обучения позволит оптимизировать процесс обучения с целью формирования иноязычной компетентности студентов.

Задания 1-5 направлены на отработку умений и навыков смыслового анализа и моделирования текста, в основе этих заданий лежит аналитико-синтетический метод обработки информации с развитием соответствующих метакогнитивных стратегий. Эти задания направлены на развитие мышления, памяти, рефлексии, на привлечение и сопоставление знаний из разных областей деятельности, на структурирование и систематизацию имеющихся и получаемых знаний.

Задания 6-10 содержат упражнения, выполнение которых позволяет оценить адекватность извлечения смысловой информации из текста.

Степень сложности заданий для самостоятельной работы может быть адаптирована к уровню подготовленности студентов, степени сложности, удовлетворяют принципу постепенного перехода с одного уровня самостоятельности на другой.

Содержание учебных заданий

№	Содержание	Критерии оценки
1	Просмотровое чтение текста – чтение, имеющее целью ознакомление с содержанием текста и определение его общей тематики.	Сжатый информационно-емкий ответ, содержащий сообщение темы текста.
2	Построение модели композиционной структуры текста. Выделение фрагментов текста по типу (повествование, описание, рассуждение).	Правильное определение типа текста или комбинации фрагментов различных типов.
3	Выбор адекватной когнитивной схемы из предложенных и сопоставление предложений текста с элементами схемы (например, описание признаков объекта, описание классификации).	Адекватность выбранной обучаемыми схемы содержанию и структуре текста; сопоставление предложений из текста с соответствующими элементами схемы.
4	Построение смысловой модели текста в	Выявление всех необходимых

	соответствии с выбранной схемой. Выявление компонентов модели на основе проведенного смыслового анализа, целью которого является выделение инвариантной информации для формулирования целевого замысла текста.	компонентов модели и соответствующих отношений между ними.
5	Графическая репрезентация текста. Построение графа, отражающего смысловое содержание высказывания.	Четкая репрезентация в виде графа когнитивно значимой информации текста, передача отношений между элементами смысловой модели.
6	Выявление ключевых слов – информация, которая должна быть обязательно передана при воспроизведении.	Выявление 5-7 ключевых слов или словосочетаний.
7	Ответы на смысловые вопросы к тексту. Вопросы к тексту, ответы на которые не содержатся в тексте в явном виде (содержащие имплицитную информацию).	Уровень понимания смысла текста, выявление имплицитной информации.
8	Постановка студентами смысловых вопросов к тексту. Содержат смысловую информацию, являются результатом сопоставления обобщенной и ситуативной семантической информации.	Использование базовых (фоновых) знаний, контекстной информации, отражение смысловых отношений, прослеживающихся в тексте.
9	Краткое письменное изложение основного содержания текста.	Неизменная содержательная сущность сообщения при его преобразовании.
10	Формулирование заголовка. Предельно сжатая передача основной идеи текста.	Отражение смысловой идеи сообщения в предельно сжатой форме.

Согласно используемой авторской методике обучения освоение грамматики английского языка происходит не изолированно на отдельных примерах, а в контексте, за счет выявления не только грамматических, но и смысловых связей, что важно для получения ключевой информации высказывания; происходит формирование общих и специальных знаний и их систематизация, а также формирование метакогнитивных стратегий, что важно для междисциплинарной интеграции. Задания направлены на формирование умений выявлять имплицитную информацию, строить инвариант сообщения, умений «общаться с текстом». Таким образом, обучение направлено на комплексное формирование иноязычной компетентности студентов.

В целом разумное сочетание самостоятельной работы с иными

видами учебной деятельности позволяет реализовать три основных компонента университетского образования:

– познавательный, который заключается в усвоении студентами необходимой суммы знаний по избранной специальности, а также способности самостоятельно их пополнять;

– развивающий, т.е. выработка навыков аналитического и логического мышления, способности профессионально оценить ситуацию и найти правильное решение;

– воспитательный – формирование профессионального правового сознания, мировоззренческих установок, связанных не только с выбранной ими специальностью, но и с общим уровнем развития личности.

Задания для самостоятельной работы соответствуют основному профилю студентов, а их объем определен часами, отведенными в рабочей программе.

Результаты самостоятельной работы студента контролируются преподавателем и учитываются в ходе итоговой аттестации студента по изучаемой дисциплине.

Содержание дисциплины «Иностранный язык», структурированное по темам (разделам)

I семестр		
№ п/п	Раздел (тема) дисциплины	Содержание
1	2	3
1.	Модуль 1	Вводный курс Noun. Pronouns. Adjectives. Adverbs. Видовременная система глагола (Часть 1).
2.	Модуль 2	Образование. Видовременная система глагола (Часть 2).
3.	Модуль 3	Наука и технология. Видовременная система глагола (Часть 3).
4.	Модуль 4	Техника в 21 веке. Неличные формы глагола (Часть 1).

II семестр		
№ п/п	Раздел (тема) дисциплины	Содержание
1	2	3
1.	Модуль 5	Гибкие производственные системы. Неличные формы глагола (Часть 2).
2.	Модуль 6	Компьютеры. Неличные формы глагола (Часть 3).
3.	Модуль 7	Конструкционные материалы. Сложные грамматические конструкции (Часть 1).
4.	Модуль 8	Технология конструкционных материалов I, II. Сложные

		грамматические конструкции (Часть 2).
5.	Модуль 9	Технология конструкционных материалов II. Обобщение грамматического материала.

III семестр		
№ п/п	Раздел (тема) дисциплины	Содержание
1	2	3
1.	Модуль 10	Проектирование и строительство. Сослагательное наклонение (Часть 1).
2.	Модуль 11	Сослагательное наклонение (Часть 2).
3.	Модуль 12	Сложные предложения (Часть 1).
4.	Модуль 13	Сложные предложения (Часть 2).
5.	Модуль 14	Обобщение грамматического материала.

Смысловой анализ иноязычного текста

Понимание текста происходит путем анализа и выявления семантических признаков элементов модели, соответствующих контексту (анализ) и заполнения ролей глубинной смысловой модели (с учетом отношений между элементами) (синтез).

Умения смыслового анализа и моделирования можно трактовать как средство, направленное на: зрительное восприятие читаемого; осмысление и понимание значения читаемого; извлечение и активную переработку информации из письменного текста; декодирование смысла, заложенного автором в тексте; совершенствование личности читателя посредством развития его когнитивного мышления и речи.

Таким образом, происходит формирование определенных стратегий восприятия текста, которые включают в себя идентификацию контекста в общем плане, а также связанных с этим контекстом знаний, что приводит к активизации соответствующей ментальной схемы.

Целью смыслового анализа является научение оперированию получаемой информации, которое опирается на когнитивные механизмы мышления и памяти и способствует пониманию смысла текста.

Для лучшего понимания в качестве примера приведем вариант осуществления смыслового анализа и моделирования научного текста, согласно разработанной С.Э. Харзеевой процедуре, на

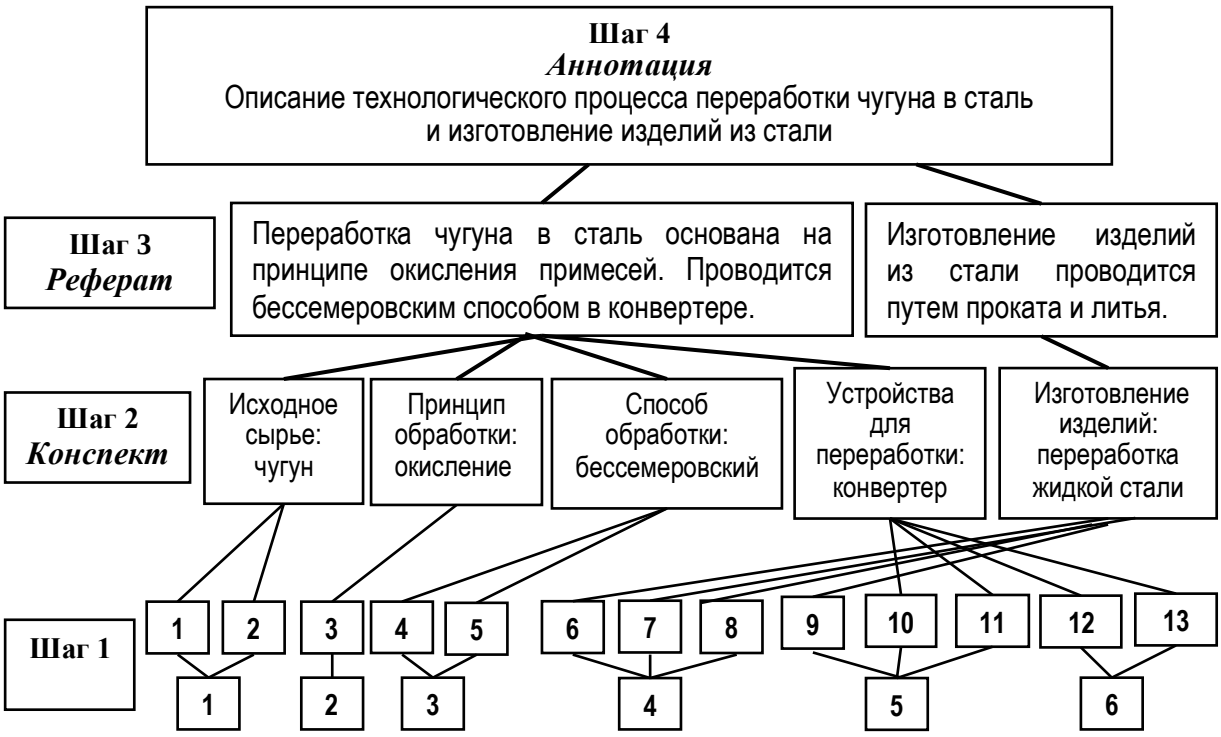
русском языке. Выполнение заданий осуществляется в соответствии с четким алгоритмом (рис. 1):

Производство стали

Производство стали основывается преимущественно на чугуне, получаемом из руды в доменных печах. При этом содержание углерода в чугуне снижается путем окисления от 3,5% до 1,3-0,02% в зависимости от требуемого сорта стали.

Методы получения стали используют высокие температуры и дают сталь в жидком состоянии, причем находящиеся также в жидком состоянии шлаки легко отделяются. Жидкая сталь заливается в кокиль для получения чушек, которые затем прокатываются на прокатных станах в заготовки, рельсы, балки, прутковое железо, трубы или в листовую сталь, либо в сталелитейных цехах разливается в сухие песочные формы для получения стального литья.

По введенному в 1855 году Бессемером бессемеровскому способу превращение чугуна в сталь происходит в опрокидывающемся сосуде (конвертере), снабженном огнеупорной футеровкой, содержащей кремниевую кислоту, в который чугун заливается в жидком состоянии. Через конвертер снизу продувается воздух или обогащенная кислородом воздушная смесь, которая проходит через ванну с чугуном, что вызывает быстрое выгорание углерода и спутников железа.



Предложения исходного текста

Рис. 1 Реализация процедуры смыслового анализа и моделирования текста (по С.Э. Харзеевой)

Вышеназванный метод был адаптирован для применения к иноязычным научным текстам с учетом языковых различий [10]. Моделирование смыслового предпереводческого анализа представлено в таблице 1.

Таблица 1

Модель смыслового информационного анализа текста

Виды действий	**Этапы моделирования**
Аналитические действия	1) выделение исходных предложений из текста
	2) выявление глагольных и отглагольных форм в исходных предложениях
	3) восстановление глаголов-сказуемых путем трансформации выявленных отглагольных форм
	4) построение простых предложений с использованием глаголов-сказуемых
Синтетические действия	5) соотнесение полученных простых предложений с элементами когнитивной схемы и соответствующее переструктурирование текста

Учитывая способы и формы сохранения и репрезентации информации в когнитивных ментальных структурах человека (о чем говорилось ранее), могут разрабатываться различные варианты когнитивных схем. Некоторые варианты когнитивных схем, которые могут служить опорой при реализации смыслового предпереводческого анализа в качестве модели, приведены в таблице 2 [10].

Таблица 2

Варианты когнитивных схем

Схема «Научное исследование» “Scientific Research” Описание проблемы (постановка задачи) Факты Гипотезы Аргументы Выводы Заключение	**Схема «Естественнонаучное явление» “Natural-Science Phenomenon”** Агенты Действие (феноменологическое описание) Инструмент (механизм действия) Условия Результат
Схема «Технология» “Technology” Цель Средства Объект обработки: материалы исходные продукты конечные продукты Способ обработки Условия обработки Результат: эффективность широта применения Персонал и организация работы	**Схема «Биографическое описание личности ученого» “Biographic Description”** Область деятельности Жизненный путь Хронология жизненных событий Личная жизнь, семья Наиболее известные произведения (работы) Внешность Личностные качества Политические убеждения Критика, полемика
Схема «Развитие техники» “Technological Expansion” Научная область Этапы развития: научные идеи/события Время Место Автор Технические характеристики Теоретическая значимость Практическая значимость	**Схема «Классификация» “Classification”** Предметная область Классифицируемое множество объектов Классификационные признаки (критерии классификации) Типы классификационных объектов **Схема «Описание объекта» “Description of an Object”** Объект Состав Структура Свойства/ характеристики Получение Применение

Использование когнитивных схем, на наш взгляд, являются самым важным элементом процедуры, поскольку «вынуждает» использовать накопленный когнитивный опыт, способствует актуализации и расширению фоновых знаний и ведет к адекватному извлечению информации из иноязычного научного текста, а также переносу знаний из одной области в другую.

Модель процедуры смыслового предпереводческого анализа приведена ниже:

Модель смыслового анализа текста

Текст[1]

Carbon tetrachloride is a colorless and inflammable liquid that can be produced by combining carbon disulfide and chlorine. This compound is widely used in industry today because of its effectiveness as a solvent as well as its use in the production of propellants. Despite its widespread use in industry, carbon tetrachloride has been banned for home use. In the past, carbon tetrachloride was a common ingredient in cleaning compounds that were used throughout the home, but it was found to be dangerous: when heated, it changes into a poisonous gas that can cause severe illness and even death if it is inhaled. Because of this dangerous characteristic, the United States revoked permission for the home use of carbon tetrachloride in 1970. The United States has taken similar action with various other chemical compounds.

В схематичном виде модель текста с использованием когнитивной схемы может быть представлена следующим образом (Рис. 8):

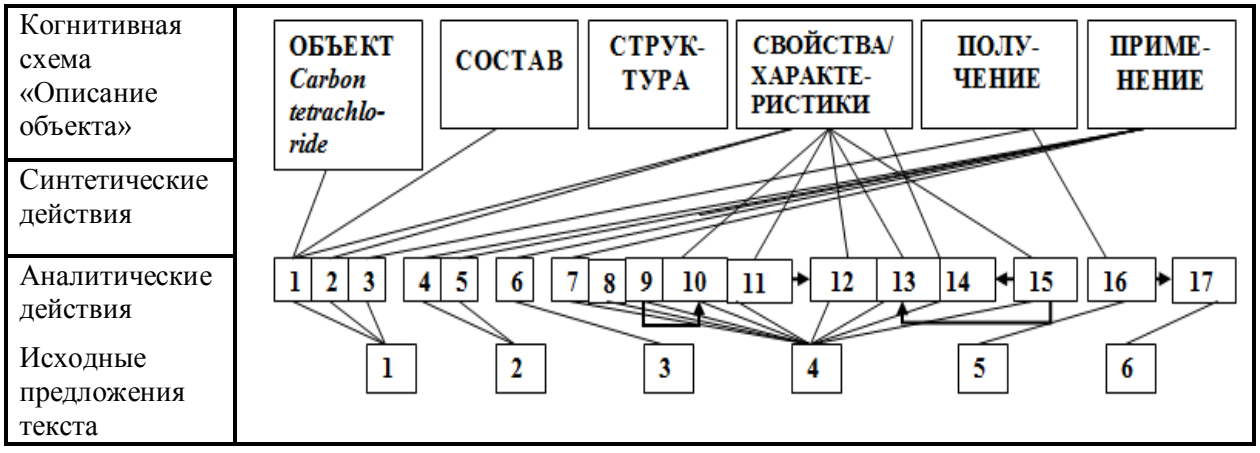


Рис. 8. Модель текста “Carbon tetrachloride”, представленная согласно схеме «Описание объекта

[1] Источник: Phillips D. Longman Complete Course for the TOEFL Test. Longman, 2001. − 684 p.: p. 344

То есть выполняются следующие действия:

1 − выявление исходных предложений из текста;

2 − выявление глагольных и отглагольных форм в исходных предложениях;

№ предлож.	**3. Восстан. гл.-сказ.** (трансформ. выявл. отглаг. форм)	**4. Построение простых предложений с использованием глаголов-сказуемых** (восстановление подлежащих, выраженных местоимениями)
1	is	**1.** Carbon tetrachloride is a colorless liquid. **2.** Carbon tetrachloride is an inflammable liquid.
	can be produced	**3.** Carbon tetrachloride (that) can be produced by combining carbon disulfide and chlorine.
2	is used	**4.** This compound (carbon tetrachloride) is widely used in industry today as a solvent. **5.** This compound (carbon tetrachloride) is widely used in industry today in the production of propellants.
3	has been banned	**6.** Carbon tetrachloride has been banned for home use.
4	was	**7.** Carbon tetrachloride was a common ingredient in cleaning compounds.
	were used	**8.** Cleaning compounds (that) were used throughout the home.
	was found	**9.** It was found.→
	is	**10.** →Carbon tetrachloride is dangerous.
	is heated changes	**11.** When carbon tetrachloride is heated. **12.** Carbon tetrachloride (it) changes into a poisonous gas.
	can cause is inhaled	**13.** A poisonous gas (that) can cause severe illness. **14.** A poisonous gas (that) can cause even death. **15.** If a poisonous gas (it) is inhaled**.**
5	revoked	**16.** The United States revoked permission for the home use of carbon tetrachloride in 1970.
6	has taken	**17.** The United States has taken similar action with various other chemical compounds.

5 − соотнесение полученных простых предложений с элементами когнитивной «схемы» и соответствующее переструктурирование текста

Таким образом, полная модель текста при реализации процедуры смыслового анализа принимает следующий вид (Таблица 3):

Таблица 3

Полная модель текста при реализации процедуры смыслового анализа

Схема «Описание объекта
Объект *Carbon tetrachloride*
Состав **––––**
Структура **––––**
Свойства/ характеристики **1.** *Carbon tetrachloride is a colorless liquid.* **2.** *Carbon tetrachloride is an inflammable liquid.* **9.** *It was found.* → **10.** *Carbon tetrachloride is dangerous.* **11.** *When carbon tetrachloride is heated* → **12.** *Carbon tetrachloride changes into a poisonous gas.* **15.** If a *poisonous gas is inhaled* ↗ **13.** *A poisonous gas can cause severe illness.* ↘ **14.** *A poisonous gas can cause even death.*
Получение **3.** *Carbon tetrachloride can be produced by combining carbon disulfide and chlorine.*
Применение **4.** *This compound (carbon tetrachloride) is widely used in industry today as a solvent.* **5.** *This compound (carbon tetrachloride) is widely used in the production of propellants.* **6.** *Carbon tetrachloride has been banned for home use.* **7.** *Carbon tetrachloride was a common ingredient in cleaning compounds.* **8.** *Cleaning compounds (that) were used throughout the home.* **16.** *The United States revoked permission for the home use of carbon tetrachloride in 1970.* **17.** *The United States has taken similar action with various other chemical compounds.*

Естественно, модель вышеприведенного текста может быть записана и в более сжатом виде (Таблица 4).

Таким образом, при выполнении смыслового анализа с целью адекватного извлечения информации и последующего перевода, мы объединяем «психологическое» и «лингвистическое», а это важно для осмысленного восприятия текста. Постигая структуру иноязычного текста с использованием разработанной процедуры и когнитивных схем, работающие с текстом переходят от уровня предложения на уровень дискурса и актуализации фоновых знаний; выполняющие смысловой анализ текста проходят через следующие уровни восприятия текста: материальная форма знака, предметное

значение, смысловое значение, оценочное отношение, переживание, что свидетельствует о субъективации, то есть понимании смысла сообщаемого.

Таблица 4

Модель текста «Carbon tetrachloride»
(схема «Описание объекта»)

Элемент схемы	Информация, извлеченная из текста
Объект	*Carbon tetrachloride*
Состав	–
Структура	–
Свойства/ характеристики	*inflammable liquid* *dangerous* *when heated, it changes into a poisonous gas, which, if inhaled, causes severe illness, even death*
Получение	*combining carbon disulfide and chlorine*
Применение	*is widely used in industry as a solvent* *is widely used in the production of propellants* *has been banned for home use* *was a common ingredient in cleaning compounds*

Контекст и когнитивные схемы помогают воспринимать экстралингвистическую информацию, которая способствует актуализации полученных ранее фоновых знаний, их расширению и формированию когнитивных ментальных схем. Структурирование информации способствует надежному адекватному размещению полученной информации в когнитивных ментальных структурах читающего.

ЗАДАНИЯ ДЛЯ САМОСТОЯТЕЛЬНОЙ РАБОТЫ

Text 1

Tasks to Text 1.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:

1. Why sea sand should not be used for making mortar?
2. Why sand is used in mortars?
3. What are the important properties of cement mortar?
4. Briefly explain tests conducted on mortar.

VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Mortar is an intimate mixture of binding material, fine aggregate and water. When water is added to the dry mixture of binding material and the inert material, binding material develops the property that binds not only the inert material but also the surrounding stones and bricks. If the cement is the binding material, then the mortar is known as cement mortar. Other mortars commonly used are lime mortar and mud mortar. The inert material used is sand. In this text, first an introduction is given to the inert material sand and then the proportioning, mixing, curing, properties and uses of different mortars is explained.

Sand is a natural product which is obtained as river sand, nalla sand and pit sand. However, sea sand should not be used for the following reasons:

1. It contains salt and hence structure will remain damp. The mortar is affected by efflorenscence and blisters appear.

2. It contains shells and other organic matter, which decompose after some time, reducing the life of the mortar.

Sand may be obtained artificially by crushing hard stones. Usually artificial sand is obtained as a by-product while crushing stones to get jelly (coarse aggregate).

Sand is used in mortar and concrete for the following purpose:

1. It subdivides the paste of binding material into thin films and allows it to adhere and spread.

2. It fills up the gap between the building blocks and spreads the binding material.

3. It adds to the density of the mortar.

4. It prevents the shrinkage of the cementing material.

5. It allows carbon dioxide from the atmosphere to reach some depth and thereby improve setting power.

6. The cost of cementing material per unit volume is reduced as this low cost material increases the volume of mortar.

7. Silica of sand contributes to formation of silicates resulting into the hardened mass.

The properties of good sand are:

1. It should be chemically inert.
2. It should be free from organic or vegetable matter.
3. It should be free from salt.
4. It should contain sharp, angular and coarse grains.
5. It should be well graded.
6. It should be hard.

Cement mortar

For preparing mortar, first a mixture of cement and sand is made thoroughly mixing them in dry condition.

Water is gradually added and mixed with shovels. The cement to sand proportion recommended for various works is as shown is Table 1.

Table 1. Cement to sand proportions for various works

S. No.	Works	Cement : Sand
1	Masonry works	1:6 to 1:8
2	Plastering masonry	1:3 to 1:4
3	Plastering concrete	1:3
4	Pointing	1:2 to 1:3

Curing: Cement gains the strength gradually with hydration. Hence it is necessary to see that mortar is wet till hydration has taken place. The process to ensure sufficient moisture for hydration after laying mortar/concrete is called curing. Curing is ensured by spraying water. Curing normally starts 6–24 hours after mortar is used. It may be noted that in the initial period water requirement is more for hydration and gradually it reduces. Curing is recommended for 28 days.

The following are the important *properties* of cement mortar:

1. When water is added to the dry mixture of cement and sand, hydration of cement starts and it binds sand particles and also the surrounding surfaces of masonry and concrete.

2. A mix richer than 1:3 is prone to shrinkage.

3. Well-proportioned mortar provides impervious surface.

4. Leaner mix is not capable of closing the voids in sand and hence the plastered surface is porous.

5. The strength of mortar depends upon the proportion of cement and sand. Strengths obtained with various proportion of cement and sand is shown in Table 2.2.

Table 2. Strengths cement mortar

S. No.	Cement:Sand	Compressive Strength
1	1:3	10 N/mm^2
2	1:4	7.5 N/mm^2
3	1:5	5.0 N/mm^2
4	1:6	3.0 N/mm^2
5	1:8	0.7 N/mm^2

Mortar is used to bind masonry units like stone, bricks, cement blocks; to plaster slab and walls make them impervious; to give neat finishing to walls and concrete works; for pointing masonry joints; for preparing building blocks; as a filler material in ferro cement works; to fill joints and cracks in walls; as a filler material in stone masonry.

Lime mortar

Fat lime and hydraulic limes are used for making lime mortar. If fat lime is used sand mixed is normally 2 to 3 times its volume. If hydraulic lime is used sand mixed is only 2 times the volume of lime. Lime is prepared by pounding, if quantity required is small or by grinding, if the required quantity is more.

For pounding pits are formed in hard grands. The size of pit is usually 1.80 m long, 0.4 m wide and 0.5 m deep. It is provided with lining of bricks or stones. Lime and sand dry mixed with required proportion is placed in the pit. Small quantity of water is added at intervals. In each interval the mix is pounded with wooden pounders and mortar is turned up and down. The process is continued till uniform colour and desired consistancy is achieved.

Grinding is the better way of getting good mix. The grinding may be carried out in bullock driven grinding mill or in power driven grinding mill.

A typical bullock driven grinding mill consists of a circular trench of radius 3 to 4.5 m, 0.3 m wide and 0.4 m deep. A wooden shaft pivoted at centre carries a stone wheel of width just 50 mm to 100 mm less than that of trench. Bullock drive this wheel in the trench for grinding mortar. The dry mix is placed in the trench. Water is added gradually and bullock driven stone wheels grind the mix. A worker turns the mix up and down regularly. This method of preparing mortar needs 6 hours and can produce about 1.7 m^3 of mortar.

Some ***special mortars*** are cement clay mortar (quality of clay mortar can be improved by adding cement to the mix, normal proportion of clay to cement is 1:1, improvements in the durability of mud-mortar, economical); gauged mortar (adding cement to lime mortar, usual proportion of cement, lime and sand are 1:1:6, 1:2:9 and 1:3:12, cheaper than cement mortar and its quality is between that of cement mortar and lime mortar; decorative mortar (use of coloured cement to give pleasant appearance to outer walls) .

Tests on mortar

The following tests are conducted on the prepared mortars to ensure their quality:

1. Crushing Test is carried out on a brick work with the mortar. This brick work is crushed in a compression testing machine and the load is noted down. Then the crushing strength is obtained as load divided by cross-sectional area.

2. Tensile Strength Test: the mortar prepared is placed in a mould of bricket which has central cross-sectional area as 38 mm × 38 mm. After curing the briquette is pulled under the grips of tensile testing machine. The ultimate load noted. Then the tensile strength of mortar is load divided by the central cross-sectional area.

3. Adhesive Test: two bricks are joined together with mortar to be tested The upper brick is suspended from an overhead support. A board is hung from the lower brick. Then weights are added to the board till the bricks separate. The adhesive strength is the load divided by area of contact.

Text 2

Tasks to Text 2.

I. Read the text. What is this text about?

II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
1. The mesh used may be metallic or any other suitable material.”
2. What do you understand by batching of concrete?
3. Why concrete should be compacted after placing?
4. What is meant by curing of concrete?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Plain concrete, commonly known as concrete, is an intimate mixture of binding material, fine aggregate, coarse aggregate and water. This can be easily moulded to desired shape and size before it loses plasticity and hardens. Plain concrete is strong in compression but very weak in tension.

Major ingredients of concrete are: binding material (like cement, lime, polymer), fine aggregate (sand), coarse aggregates (crushed stone, jelly), and water. A small quantity of admixtures like air entraining agents, water proofing agents, workability agents etc. may also be added to impart special properties to the plain concrete mixture.

Depending upon the proportion of ingredient, strength of concrete varies. In proportioning of concrete it is kept in mind that voids in coarse aggregates are filled with sand and the voids in sand are filled with cement paste. Cement is the binding material. After addition of water it hydrates and binds aggregates and the surrounding surfaces like stone and bricks. Generally richer mix (with more cement) gives more strength. Coarse aggregate consists of crushed stones. They give mass to the concrete and prevent shrinkage of cement. Fine aggregate consists of river sand. It prevents shrinkage of cement. When surrounded by cement it gains mobility enters the voids in coarse aggregates and binding of ingredients takes place. It adds density to concrete, since it fills the voids. Denser the concrete higher is its strength.

Water used for making concrete should be clean. It activates the hydration of cement and forms plastic mass. As it sets completely concrete becomes hard mass. Water gives workability to concrete which means water makes it possible to mix the concrete with ease and place it in final position. More the water better is the workability. However excess water reduces the strength of concrete. To achieve required workability and at the same time good strength a water cement ratio of 0.4 to 0.45 is used, in case of machine mixing and water cement ratio of 0.5 to 0.6 is used for hand mixing.

To produce uniform and good concrete, it is necessary to *mix* cement, sand and coarse aggregate, first in dry condition and then in wet condition after adding water. The following methods are practiced: *hand mixing* and *machine mixing*. In large and important works machine mixing is preferred. Figure 1 shows a typical concrete mixer. Required quantities if sand and coarse aggregates are placed in the drum of the mixer. 4 to 5 rotations are made for dry mixing and then required quantity of cement is added and dry mixing is made with another 4 to 5 rotations. Water is gradually added and drum is rotated for 2 to 3 minutes during which period it makes about 50 rotations. At this stage uniform and homogeneous mix is obtained.

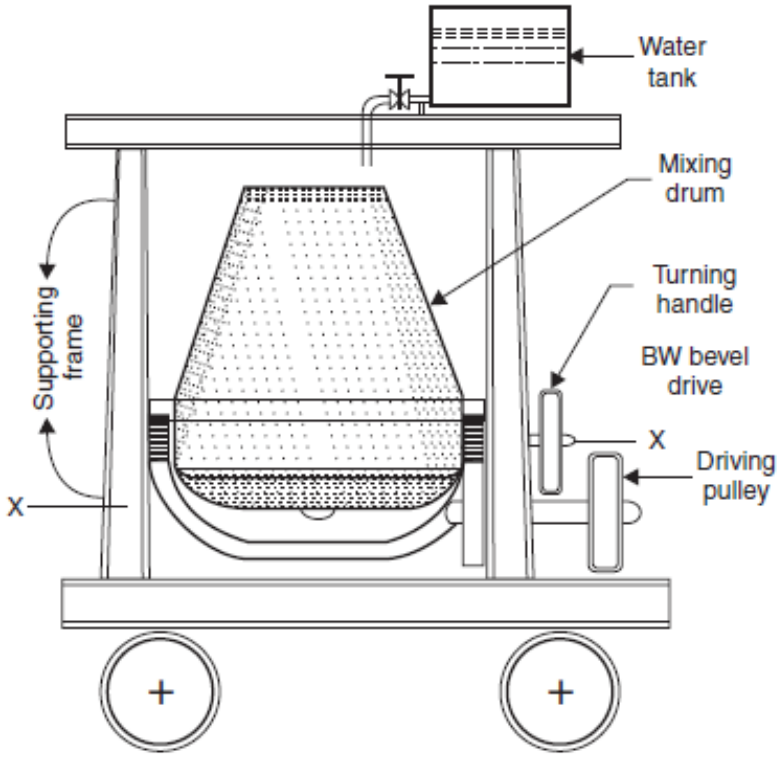


Figure 1. Concrete mixer

In the process of placing concrete, air is entrapped. The entrapped air reduces the strength of concrete up to 30%. Hence it is necessary to remove this entrapped air. This is achieved by compacting the concrete after placing it in its final position. Compaction can be carried out either by hand or with the help of vibrators.

Curing may be defined as the process of maintaining satisfactory moisture and temperature conditions for freshly placed concrete for some specified time for proper hardening of concrete. If curing is not done properly, the strength of concrete reduces. Cracks develop due shrinkage. The durability of concrete structure reduces.

The following curing methods are employed: spraying of water, wet covering the surface, ponding, steam curing.

Properties of Concrete

Concrete has completely different properties when it is the plastic stage and when hardened. Concrete in the plastic stage is also known as green concrete. The properties of green concrete include: workability, segregation, bleeding, and harshness.

The properties of hardened concrete are: strength, resistance to wear, dimensional changes, durability, and impermeability.

The following are some of the ***important tests*** conducted on concrete:

1. Slump Test is conducted to determine the workability of concrete.

2. Compaction Factor Test is another test to identify the workability of concrete. This test is conducted in the laboratory.

3. Crushing Strength Test.

Uses of Concrete

1. As bed concrete below column footings, wall footings, on wall at supports to beams

2. As sill concrete

3. Over the parapet walls as coping concrete

4. For flagging the area around buildings

5. For pavements

6. For making building blocks.

However, major use of concrete is as a major ingredient of *reinforced* and *prestressed* concrete.

Concrete is good in resisting compression but is very weak in resisting tension. Hence reinforcement is provided in the concrete wherever tensile stress is expected. The best reinforcement is steel, since tensile strength of steel is quite high and the bond between steel and concrete is good. As the elastic modulus of steel is high, for the same extension the force resisted by steel is high compared to concrete.

Properties of reinforced cement concrete (CCR):

1. It should be capable of resisting expected tensile, compressive, bending and shear forces.
2. It should not show excessive deflection and spoil serviceability requirement.
3. There should be proper cover to the reinforcement, so that the corrossion is prevented.
4. The hair cracks developed should be within the permissible limit.
5. It is a good fire resistant material.
6. When it is fresh, it can be moulded to any desired shape and size.
7. Durability is very good.
8. R.C.C. structure can be designed to take any load.

Reinforced brick concrete (RBC) is the combination of reinforcement, brick and concrete. It is well known fact that concrete is very weak in tension. Hence in the slabs, lintels and beams the concrete in the portion below the neutral axis do not participate in resisting the load. It acts as a filler material only. Hence to achieve economy the concrete in tensile zone may be replaced by bricks or tiles. The reinforcement may be steel bars, expanded mesh etc.

Prestressing the concrete is one of the methods of utilizing entire concrete. The principle of prestressed concrete is to introduce calculated compressive stresses in the zones wherever tensile stresses are expected in the concrete structural elements. When such structural element is used, stresses developed due to loading has to first nullify these compressive stresses before introducing tensile stress in concrete. Thus, in prestressed concrete entire concrete is utilized to resist the load. Another important advantage of PSC is hair cracks are avoided in the concrete and hence durability is high. The fatigue strength of PSC is also more. The deflections of PSC beam is much less and hence can be used

for longer spans also. PSC is commonly used in the construction of bridges, large column free slabs and roofs.

Fibre-reinforced concrete (FRC) can be defined as a composite material of concrete or mortar with discontinuous and uniformly distributed fibres. Commonly used fibres are of steel, nylon, asbestos, coir, glass, carbon and polypropylene. Fibre reinforced concrete is having better tensile strength, ductility and resistance to cracking.

It is used for manufacturing precast products like pipes, stairs, wall panels, manhole covers and boats etc.

The term *ferro-cement* implies the combination of ferrous product with cement. Generally this combination is in the form of steel wires meshes embedded in a portland cement mortar. Wire mesh is usually of 0.8 to 1.00 m diameter steel wires at 5 mm to 50 mm spacing and the cement mortar is of cement sand ratio of 1:2 or 1:3. 6 mm diameter bars are also used at large spacing, preferably in the corners. Sand may be replaced by baby jelly. The water cement ratio used is between 0.4 to 0.45. Ferro-cement reinforcement is assembled into its final desired shape and plastered directly. There is no need for form work. Minimum two layers of reinforcing steel meshes are required. According to American Concrete Institute "Ferro cement is a thin walled reinforced concrete construction where usually a hydraulic cement is reinforced with layers of continuous and relatively small diameter mesh.

Text 3

Tasks to Text 3.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:

1. 1. What are the principles of building planning?
2. Can you name any aspects of orientation?
3. Which principles should be taken into account with respect to utility?

VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

All buildings should be properly planned, keeping in view the various requirements of a good building.

Except strength requirement, all other requirements of a good buildings are taken care at the stage of planning. Strength requirement is taken care during structural design of building components. However, in planning the building by-laws of the statutory authorities should not be violated. Planning of the building is an art combined with science.

Principles of planning of buildings may be grouped into: orientation, energy efficiency, utility, other requirements of the building.

Orientation means setting out the plan of the building with respect to north-south and east-west directions to provide an opportunity to user to enjoy sun-shine and breeze when required and to avoid the same whenever not required. This is also known as planning the aspect of a building. Aspect means arrangement of doors, windows in the external wall to make good use of nature. This term has nothing to do with the architectural aspect of outlook of building.

The following are the required aspects for various parts of the building in the northern hemisphere of earth: kitchen – eastern aspect; dining room – southern aspect to enjoy winter sun; drawing and living room – southern or south-eastern aspect to enjoy winter sun; bedrooms – western or south-western aspect to enjoy breez in summer; reading room, class room, stairs, northern aspect to enjoy diffused light.

A building should be planned in such a manner that it gives maximum day lighting, ventilation and heat insulation. If these requirements are fulfilled, requirement of electric energy comes down.

Natural light provides hygienic atmosphere. Light should not be glaring but it should be uniformly distributed. Providing windows and ventilators of appropriate size at suitable positions contributes a lot for natural lighting. For residential buildings window area to floor area should not be less than 1/10th while for school buildings it should not be less than 1/5th of floor area. For factory buildings north light trusses should be provided to get maximum diffused light.

Ventilation is the circulation of the air in the building. Natural ventilation can be achieved by selecting and positioning of doors, windows and ventilators at suitable places. Always cross ventilations should be planned suitably. Provision of ventilators at roof level helps in driving out hot air. In case it is not possible to achieve natural ventilation for any part of the building provide ordinary or exhaust fans.

Thicker exterior walls provide insulation against heat. Proper ventilation also helps in achieving heat insulation. Sun shades provided to doors, windows and ventilators help in achieving heat insulation. In factories and assembly halls height should be more to reduce temperature inside the building. The position of furnaces in the factories should be located away from the other parts of the factory. The openings should be provided at higher level in the wall to remove hot air.

Principles of planning for suitable utility are:

1. Roominess: It refers to suitable proportioning of length, width and height of rooms in the building to get maximum benefit from the minimum dimensions. Length to width ratio should be 1.2 to 1.5. If it is nearly square lot of area is wasted for movement, while, it is more than 1.5, it gives the ‘tunnel’ effect. Doors for rooms should be properly located so that utility and privacy are maximum. Cupboards and lofts should be provided to increase roominess. Proper colours to wall and floor also give roominess effect. Light colour gives effect of more space.

2. Furniture Requirements: In planning residential, office, laboratory, hospital buildings positions of required furniture should be drawn and then room dimensions, positions of doors, windows, wardsities etc. planned. In case of planning a hostel room for two students it may need centrally placed door while if it is for three students, it should be near the end of front wall. Positions of cots, study tables and cupboard should be drawn and room planned. In designing a living room, positions of sofa, chairs, T.V. show case etc. should be drawn and size of the room and positions of doors fixed. Availability of circulation area should be checked. Thus, the furniture requirement influences the planning of a building to a great extent.

3. Grouping: Grouping means disposition of various rooms in the building for the convenience of users and their utility. A dining room should be close to the kitchen, white sanitary block should be away from kitchen, but convenient to bedrooms. In case of offices, administrative

department is located centrally. In factories, various sections are located such that product moves in one direction to get finally assembled after least movement. In residential buildings grouping is to achieve comfort, privacy and efficiency while in the case of other buildings it is to achieve economical service.

4. Circulation: Circulation means the space to be provided for movement from room to room or floor to floor. Passages, lobbies, halls provided serve horizontal circulation while stairs and lifts serve vertical circulation. Within a room also a portion of it serve for circulation while some other portion serve for utility.

Principle of planning also involves planning for meeting the following requirements:

1. Sanitary conveniences include provision of bathrooms, lavatories,
urinals etc. Provision of these are not only necessities but statutory requirement also. These facilities should be located giving free access to all users. In these blocks, suitable slopes should be given to the floors to drain out water easily.

2. Prospects are about locating and selecting types of doors and windows so as to reveal pleasant features and conceal undesirable features of the buildings from a person viewing from outside.

3. Elegance means general effect produced for a viewer from outside. It depends upon proper positioning of doors, windows, ventilators, balconies etc. Elevations should be attractive. The width, height and the projections in the building contribute a lot for the elegance. Taj Mahal is an example famous for its elegance.

4. Flexibility means a room designed for a specific purpose should be possible to use for other purposes, if necessary. A study room may be planned for using as a guest room. If partition is provided between living room and dining room, it is possible to remove partition and use living room plus dining room for the family functions. If independent access is given to backyard from kitchen, backyard can be used for dinner functions. Thus, in planning flexibility also should be considered.

5. Planning should take care of privacy of one room from other room in a building as well as some parts of a building from neighbouring buildings and from streets. It is ensured by proper grouping of rooms and by suitably providing doors, windows and

ventilators. Planning the entrance at appropriate position also contributes a lot in providing privacy.

6. It may be noted that concrete and masonry (stone or brick) have better resistance to fire while steel and wood have lesser resistance. Hence reduce use of steel and wood in kitchen and bathrooms with electric heaters. Kitchen should be located so that if fire is caught it is directed away from the building by the wind rather than towards the building. In public buildings and assembly halls stair cases should be easily accessible and always more than one is provided.

7. Sound Insulation: noise pollution can be reduced by suitable planning of the building, e.g., orienting the building suitably so that rooms are kept away from road side, using hollow blocks for the walls, plugging door and window openings tightly, etc.

8. Security against Burglary: by providing thicker walls, using stronger doors and windows in outer walls, security against burgling is improved.

9. Economy without sacrificing comfort, conveniences and durability is another basic principle of planning a building. For this circulation area should be minimised. Materials should be so selected that maintenance cost is minimized.

Text 4

Tasks to Text 4.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
    1. What do you understand by the term earthquakes?
    2. What special cares are to be taken to make buildings earthquake and cyclone resistant?
    3. How a building can be made fire resistant?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.

XI. Translate the text.

Earthquakes, cyclone and fire needs special considerations in building design and construction since they are more frequent, widespread and more disastrous.

During an earthquake, ground motion occurs in a random fashion in all directions radiating from a point within earth crust, called epicentre. It causes vibrations of structures and induce inertia forces on them. As a result, structure may collapse resulting into loss of property and lives.

The earthquake resistance of small buildings may be increased by taking some precautions and measures in site selections, building planning and constructions as explained below. The building constructions should be avoided near unstable embankments, on sloping ground with columns of different heights, flood affected areas, on subsoil with marked discontinuity like rock in some portion and soil in some portion.

Symmetric plans are safer compared to asymmetric. Hence, go for square or rectangular plans rather than L, E, H, T shaped. Rectangular plans should not have length more than twice the width. Width of foundation should not be less than 750 mm for single storey building and not less than 900 mm for storeyed buildings. Depth of foundation should not be less than 1.0 m for soft soil and 0.45 m for rocky ground. Before foundation is laid remove all loose materials including water from the trench and compact the bottom. After foundation is laid back-fill the foundation properly and compact. In case of stone masonry, place each stone flat on its broadest face; place length of stones into the thickness of wall to ensure interlocking inside and outside faces of the wall.

In case of brick masonry use properly burnt bricks only; place bricks with its groove mark facing up to ensure better bond with next course.

In case of concrete blocks place rough faces towards top and bottom to get good bond; blocks should be strong; brush the top and bottom faces before laying.

In general walls of more than 450 mm should be avoided. Length of wall should be restricted to 6 m. Cross walls make the masonry

stronger. It is better to build partition walls along main walls interlinking the two.

Walls with too many doors and windows close to each other collapse early. Windows should be kept at same level. The total width of all openings in wall should not exceed 13rd the length of the wall.

Doors should not be placed at the end of the wall. They should be at least at 500 mm from the cross wall. Clear width between two openings should not be less than 600 mm.

In sloping roofs with span greater than 6 m use trusses instead of rafters. Building with 4 sided sloping roof is stronger than the one with two sided sloping, since gable walls collapse early.

Restrict balcony projections to 0.9 m. For larger projections use beams and columns.

Tall buildings are subjected to heavy horizontal forces due to inertia during earthquake. Hence, they need shear walls. A shear wall is a R.C.C. enclosure within the building built to take shear forces. It is usually built around lift room. These shear walls must be provided evenly throughout the buildings in both directions as well as from bottom to top. Apart from providing shear walls, the following techniques are also used for making tall buildings earthquake resistant: base isolation, using seismic dampers.

The idea behind base isolation is to detach (isolate) the building from the ground in such a way that earthquake motions are not transmitted up through the building, or at least greatly reduced. The flexible pads are called base-isolators, whereas the structures protected by means of these devices are called base-isolated buildings.

Another approach for controlling seismic damage in buildings is by installing seismic dampers in place of structural elements, such as diagonal braces. When seismic energy is transmitted through them, dampers absorb part of it, and thus damp the motion of the building.

A cyclone is a storm accompanied by high speed whistling and howling winds. It brings torrential rains. A cyclone storm develops over tropical ocean and blows at speed as high as 200–240 km/hour. It is usually accompanied by lightning, thunder and continuous downpour of rain. The central region of light winds and low pressure, known as the ‘eye’ of cyclone has an average diameter of 20 to 30 km. This central eye is surrounded by a ring of very strong winds extending up to 40 to

50 km beyond centre. This region is called ‘wall cloud’. In this region strongest winds and torrential rains occur. Beyond this region winds spiralling extend outwards to large distances, which goes on reducing with the distance from the centre of the cyclone.

The following care should be taken in designing buildings in cyclone prone areas: foundations should be deeper; R.C.C. framed structures are to be preferred over load bearing structures; sloping roofs should be avoided; cantilever projections should be avoided; roof and parapet wall should be properly anchored to the columns and walls; height of the buildings should be restricted; suitable wind load should be considered in the building design; openings in the wall should be less; structure should not rest on loose soil.

It is reported that in USA fire kills more people each year than all other natural disasters combined including floors, cyclones and earthquake. The fire load in a building should be kept to the minimum possible. The term fire load indicates the amount of heat liberated in kilo joules per square metre (kJ/m^2) of floor area of any compartment by the combustion of the content of the building including its own combustible part. It is determined by multiplying the weights of all combustible materials by their respective calorific values and dividing that with floor area.

A building may be made more fire resistant by using suitable materials; taking precautions in building construction; by providing fire alarm systems and fire extinguishers.

A fire resisting material (stone, granite, brick, concrete, etc.) has the following characters: it should not disintegrate under the effect of heat; it should not expand under heat so as to introduce unnecessary stresses in the building; the material should not catch fire easily; it should not lose its strength when subjected to fire.

All important buildings should be provided with fire alarm system. Alarm may be manual or automatic. Automatic alarm senses the smoke and activate bells. Fire extinguishers should be provided at all strategic points in the buildings. The common fire extinguishers are as follows: manual (e.g., carbon dioxide type); internal hydrant; automatic water sprinklers.

Text 5

Tasks to Text 5.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
    1. When and where did modelling originate?
    2. What tools and materials are necessary for modelling?
    3. What are the advantages of CAD?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Modelling allows an architect to explore an idea in a three-dimensional form. Models communicate an architectural idea in an accessible way, immediately showing aspects of scale, form and material. A model can be produced as a full-size prototype of an element (such as a door or window) at the scale of a room, or at the scale of a city (in the form of an urban model).

Physical models allow an idea to be explored in greater depth, as certain elements of the scheme or their scale may not be understood until they are seen in the context of a model form.

CAD visualisations offer impressively realistic models that can allow the viewer to choose how they move through a building. CAD models can be used to develop complex forms in the design process, allowing shapes to evolve and explore a range of forms.

Physical models were a popular device in the Renaissance period (during the early fifteenth and early seventeenth centuries in different regions of Europe), and were often relied upon as the sole means of describing an architectural idea. Drawings became the main method for architectural expression during the Beaux-Arts period (during the late nineteenth and early twentieth centuries), but from the mid 1900s, architects once again began to see the benefits of physical models as a means to communicate and shape their ideas. Antonio Gaudí for

example, famously used models to help develop the complex structural shapes of Barcelona's La Sagrada Familia cathedral. Even in today's digital world, with the advances of CAD technologies, the physical model still has an important place. It has a texture and physical presence that can be interrogated and understood. It can be viewed from many directions and suggest materiality and form.

A physical model can be made at any stage of the architectural design process, from initial concept right up to the presentation of the finished scheme. However, different 'types' of physical models tend to be used at different stages of the design process. Whatever the 'type', critical considerations when producing a physical model are scale, materials and the model's relationship to the design concept.

A concept model will describe an idea in simple terms in order to clearly communicate the underlying architectural concept. It may be that the choice of material or use of colour is crucial for this type of model in order to isolate and exaggerate the idea and ensure it is clearly and correctly understood. At this stage of the design process massing models, which explore architectural form, are a useful type of concept model as they can be quickly built to scale using materials such as foam, wood or card, and provide an understanding of the relationship between the different site areas.

Development models are produced at various stages of the design process and are intended to align the scheme's concept with the brief's specifications. These models can inform stages of the design process and may change radically as the scheme progresses. They offer the quickest means for solving and exploring three-dimensional problems and exploiting the potential for design development (as the viewer can look over, through, inside and outside a development model). A development model can be used equally well as a basis for discussion between the client and the design team or as a means for testing a particular aspect of the scheme.

Illuminated models can create an impressive effect by incorporating miniature bulbs, fibre optics, transparent or semi-opaque materials. These models are often used to highlight particular aspects of a scheme or design. As well as creating an impressive aesthetic, illuminated models can lend themselves well to representing certain projects. For example, buildings that are intended to be used heavily in

the evening (such as theatres, restaurants or bars) will have a different physical presence at night than they do in the day, and an illuminated model can suggest the impact that the lit building will have on its immediate environment.

Presentation models are models of the final scheme. They may be used for the purposes of public consultation before a scheme starts or they may provide an overview of the finished building for a client. The scale of the presentation model and the volume of surrounding architecture or landscape that it displays needs to be carefully considered. If, for example, a project relates to particular reference points in the surrounding area, such as an important building, road or route, then these should be included in the model as they will affect the development of the design.

The materials used to construct the model, and information about how these relate to the finished scheme, will provide a greater sense of realism to a presentation model.

To make models, the basic tools required are a cutting mat, a metal ruler, scissors, knives and hot-wire cutters. A cutting mat provides a base on which to cut materials. This is normally made of rubber, but a piece of hardboard or other tough surface can also be used. Rubber cutting mats have a grid printed onto them to allow straight lines to be cut quickly and easily. Metal rules provide a clear edge to cut against and will prevent the knife from slicing into the rule when in use (an advantage that a plastic rule won't have). Never use a scale rule to cut against because the knife will score its edge. Sharp knives are important for cutting materials cleanly and precisely. The cut of the material is important, so take time and make your incisions carefully. If a material is cut at an angle it won't look like a clean edge when it is joined with another piece. A scalpel blade is the most useful knife as it will be extremely sharp. It needs to be used with extreme care, as too much pressure will cause the blade to snap. Any knife work needs to be done in good light, cutting slowly and carefully. Scissors can only be used for cutting paper and very thin card. If using wood as a modelling material, then tools such as a bench saw, table saw or jigsaw are necessary for accurate cutting. Hot-wire cutters slice through foam accurately and leave a clean edge. Their fine wire is heated electrically, and the wire's

malleable quality allows shapes drawn onto the foam to be cut quickly by pushing the material against the wire.

This is a fast way to make a model of a city; a map of the area can be drawn onto the foam, which is then cut to produce block shapes.

The choice of material used to construct any model will relate to the speed with which the model needs to be made, the stage of the design idea and what the model is aiming to explore or explain. To decide which materials to incorporate in your model it is necessary to consider whether it needs to be representative of the 'real' materials that are to be used in the design scheme, or whether you want to produce a 'neutral' model, which concentrates on the building form and mass.

'Real' models can represent a material quality of the architectural idea. In some cases the model could be made of a similar material to that intended for the finished building, however this is not always appropriate or practical. Sometimes it may only be necessary to demonstrate a particular characteristic of the building's material in the model form. For example, if an architectural design incorporates a metal roof that is intended to be highly reflective, this could be emphasised by using metal, whilst other materials may be representative of the building's form.

Models that are made of materials such as card or wood can be described as neutral. The final scheme will almost always be made of other materials, but neutral materials will sufficiently represent the mass and form of the scheme on its site.

When choosing the material for your model, it can be a good idea to consider any surrounding buildings on the site. Proposed and existing scheme models will read more clearly if each is differentiated by material type or colour. Also, the scale of the model will have an impact on the materials it is to be built from. A model showing a city will have less detail than one showing an interior, and more detailed models may have layers of material applied to them to create interest or a sense of realism.

Card is available in many weights and colours and can be cut accurately with a knife to achieve a straight edge. These properties make it a versatile material for model making. Corrugated card can be self-supporting, which makes it a good material for a model's walls or roof.

Also, the corrugated edge can be used to suggest particular finishes on the building.

Foam board describes a piece of foam that is sandwiched between two thin pieces of card. It is available in a variety of weights, which means that it is a useful material for representing different wall widths. It is also a fairly sturdy material, so on smaller models is self-supporting. Coloured foam board can be used to suggest different material finishes. Polystyrene is very flexible and can be cut and shaped easily to create organic forms. Styrofoam is a board material that can be easily cut, shaped, glued and painted. It has a finely textured surface that provides a smooth finish for model making. It is also lightweight, easy to handle and reusable.

Models made from wood can be easily adapted and developed. Most commonly used for model making, balsa wood comes from a tropical tree source and is very light (it has a density that is a third of other hardwoods), so it is easy to cut, which is good for creating accurate models. Other woods can be used to provide particular finishes. Cork, for example, can be used to give a carpet-like effect to a surface, which is useful for city-scale models. Wood can be finely sanded and varnished to achieve a range of finishes, and using different woods in varying grains or colours will affect the appearance of your model.

In model making, metal can be used in sheet form to suggest various building finishes, wall cladding or roofing. The sheets can be made from aluminium, copper, brass or steel, and can be perforated or corrugated and in mesh or flat-sheet form.

Transparent materials can lend interesting qualities to a physical model. Perspex and acrylic can be completely transparent or have a semi-opaque finish, and coloured acrylics can be used to good effect in model making. Using lights to illuminate transparent material will exaggerate the effect of the design’s features.

Introducing objects for which we understand the scale will make a model appear more realistic and help the viewer to understand the proportions of the architecture. These objects might be model figures, cars or trees – any elements that are immediately accessible to the viewer.

The finish should be an important consideration at all stages of the model’s construction. Time needs to be taken when cutting materials to

ensure that they are cut accurately, and care taken when assembling the pieces. This care will ensure that the model is considered as an important part of the whole design presentation.

Computer aided design (CAD) assists the generation of two-dimensional plan, section and elevation drawings as well as the creation of three-dimensional interactive models. Originally developed in the 1960s for commercial application in the aerospace and electronic industries, CAD was further developed for desktop computer use during the 1980s. Autodesk and AutoCAD were the first CAD software programmes developed for PCs (in 1981). Macintosh-based systems were developed and made available later in the decade. Today most CAD software programmes work across both platforms. Generally CAD schemes are ‘drawn’ on screen using a mouse, but some systems use a pen and graphics tablet. In such systems the CAD software renders lines and points made by the stylus onto the computer screen. Creating CAD models offers the architect the possibility to show the scheme at any stage during its development, to quickly adapt a design and respond to changes in the project brief, and to show impressive graphics and a range of interior and exterior views of a building or space.

Text 6

Tasks to Text 6.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
    1. Are Modernism and Functionalism different styles in architecture?
    2. Who followed the idea of “function follows form”?
    3. Can you explain the phrase “the spirit of the age”?
    4. phrase “the spirit of the age”?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.

XI. Translate the text.

Modernism was a huge architectural influence in the twentieth century and, as its name suggests, the modernist movement embraced the moment. Modernism interacted with a dynamic that brought together political, social and cultural changes. Most expressive minimal and organic styles refer to modernism in some way.

Modernist architecture is a term given to a number of building styles with similar characteristics, primarily the simplification of form and the elimination of ornament, that first arose around 1900. The modernist architects responded to the concepts of ‘form following function’ and ‘ornament as crime’ and their architecture, adopting forms that derived from the response to the functions or activities within the buildings, and leaving the buildings devoid of any adornment, produced characteristically clean white spaces.

By the 1940s these styles had been consolidated and became the dominant architectural style for institutional and corporate building for several decades in the twentieth century.

By the 1920s the most important figures in modern architecture had established their reputations. The three ‘founders’ are commonly recognised as Le Corbusier in France, and Ludwig Mies van der Rohe and Walter Gropius in Germany.

Mies van der Rohe and Gropius were both directors of the Bauhaus School (1919–1938), one of a number of European schools and associations concerned with reconciling craft tradition and industrial technology. The Bauhaus was one of the most influential schools of architecture, art and design of the twentieth century. Its pedagogy required a new approach, one that explored the functionality and practicality of design, housed workshops and studios, and taught architecture through aspects of contemporary culture, film, dance, art and product design. The Bauhaus promoted a new unity between art and technology, and encouraged thinking and designs that responded to both technology and ideology.

‘Form follows function’ was a phrase coined by American architect Louis Sullivan. It described a means of redirecting architecture and followed the premise that the form of any building should be defined by the activities that were to be carried out inside it, rather than

any historical precedent or aesthetic ideal. Sullivan designed the world's first skyscrapers using these functionalist design principles. The concept of functionalism was further developed by Austrian architect Adolf Loos. He wrote of 'ornament as crime', and was a proponent of the argument that any decoration on a building was both superfluous and unnecessary. The thinking of both architects created new and modern responses to architectural design. The modernist dogma, which saw the function of a building affect its final shape and form, was to produce a reactive and opposing school of architectural thought.

Sculpturalism dictates that function follows form, that the shape of a building should be the architect's primary consideration, and any functions and activities that the building is to house should be accommodated into this form.

Organic architecture describes a design approach where the form is dominant and is influenced by fluid and dynamic shapes. The construction of this type of structural form can usually only be achieved using innovative materials and cutting-edge technology to assist with the design of the spaces and the manufacture of the building. One of the earliest architects who embraced the ideals of organic architecture was Antoni Gaudí; his most famous work, La Sagrada Familia, or the Parc Güel (both in Barcelona, Spain) use forms in a sculptural way to great dynamic effect. Sculptural architecture is also exemplified by the work of Frank Gehry and his use of materials in groundbreaking and jaw-dropping ways. Gehry's architectural ideas are initially created and designed using a sculptural process too. Sculptural architecture works well with flexible materials and a fine example of this is Gehry's Guggenheim Museum in Bilbao, Spain. The museum uses heavy limestone blocks at the base, and titanium metal sheets, which curve and reflect light, form the walls and the roof. The combination of materials and the forms that they are made to adopt creates a striking contrast with the rectilinear forms of the city.

Both sculptural and organic design approaches require all the activities of a building to be fitted into the dramatic shape or form. In the best examples of this architecture, the interior and exterior experience work together to impressive effect.

Buildings can have both dramatic exteriors and produce organic or sculptural forms, and also contain an interior experience that

is equally dynamic. Floors, walls and ceilings can challenge convention and slope inward or outward to great theatrical effect. Sloped ceilings and floor planes working together can create an incredibly exaggerated effect, extending the sense of perspective inside a space. Equally, walls can be constructed to exaggerate the perceived height of a space. This creates an architectural illusion; our perception of these spaces is altered through careful use of material and form. This type of building creates unexpected encounters, sloping floors and leaning walls, for example, produce a gravity-defying experience. In such a building everything needs to be reconsidered, from the lighting and furniture, to the apertures for walls and windows. The relationship from the outside to the inside of the architecture is particularly dramatic. New types of lightweight composite materials have made architecture of this sort a real possibility.

A building that is monumental has meaning beyond its form and function. It can be monumental both in its scale and in terms of what it represents. Monuments have been constructed to celebrate important events and people for centuries. Some of these structures still exist and are a part of our culture today; think perhaps of Stonehenge or the pyramids at Giza. Buildings that become synonymous with more than their function, perhaps with a city or a culture, could be described as monumental.

Some buildings have become synonymous with their location and the identity of it. If one considers any major city it’s possible to think of a building or structure associated with it, the White House in Washington, Buckingham Palace in London or the Musée du Louvre in Paris, for example. All these buildings have meaning associated with them beyond their architecture. They have become icons of their location.

There is another, more contemporary, idea of a building or space that works as a monument and also celebrates an important event or is a place for cultural events to take place (and/or has a cultural or national significance). Examples of these include Times Square, the Sydney Opera House, the Eiffel Tower and Trafalgar Square. Such buildings or spaces can be described as having a dual purpose.

The German term zeitgeist refers to the spirit of a time. In terms of design this is an inevitably changing and shifting notion. The

zeitgeist naturally evolves as it responds to current social and cultural phenomena.

At the beginning of the twentieth century, design was responding to modernist ideals and approaches. The modernist style and its use of materials and form originated in Europe and, although not applicable in all contexts, had enormous influence in other regions across the world. The concept of an ‘international’ style was based on the notion that a style or design could exist across many cultures and have no boundaries.

One of the strengths of the international style was that the design solutions were indifferent to location, site, and climate. This was one of the reasons it was called ‘international’; the style made no reference to local history or national vernacular. Later this was identified as one of the style’s primary weaknesses.

The modernist style has, however, been adapted by some to accommodate local conditions. Examples of this are Oscar Niemeyer’s architecture in Brazil and Luis Barragan’s work in Mexico. Their style is modern in form, but uses bolder form and colour as it is influenced by local traditions.

Text 7

Tasks to Text 7.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
   1. What are the main stages of the project?
   2. Which stages can be omitted in the course of project implementation?
   3. Is concept analyses a main stage of the project development?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Depending on time and complexity, projects vary in time, but in each case their realisation represents a journey that tells the story of how a building is made This timeline shows the five key stages of a project's realisation: concept, site analysis, the design process, construction and detail development and the result.

The realisation of any project will involve a vast team of people, and each member of that team will have different skills that can be applied at different stages of the design and construction processes.

Central to the success of any architectural project will be ensuring that the team works well together and that the necessary project information is communicated clearly among all members of the team.

The members of the team can include:

1. The client who initiates the project, provides the funds for construction and is usually the building's end user. The best clients will have aspirations for their building, and these will be translated clearly into a range of activities and functionality that they want the architecture to accommodate. For example, they may have a vision in terms of what internal and external environments they expect the building to provide them with, or have expectations about what the building needs to symbolize or represent.

   All these requirements, desires and functions will then be shaped into a project brief, which is used by the architect as a springboard and measure of their design ideas.

2. Surveyors measure different aspects of building. A building surveyor measures the material and fabric of the architecture and produces drawings of an existing building on site or the location and levels of extant site features. The information in these drawings allows the site parameters to be better understood before the architect begins to consider the building's design. For example, if the site is sloped this will affect what it is possible to build.

Building surveyors can also be involved in establishing boundaries of sites and buildings. Specialists such as historic building surveyors have specific knowledge of older buildings, which can also be valuable.

A quantity surveyor measures the building's materials and by itemising and costing all these, provides an estimate of the project costs. Together with the brief and survey drawings, these projections are used

to form the contract or instructions that will indicate how the building is to be constructed.

3. Engineers are concerned with the technical application of scientific understanding to design. In short, they design systems in conjunction with the architect, whether it be the building's structure or its heating, ventilation or electrical solutions.

Structural engineers work with the various aspects of a building's structure, including the frame, the foundations and the facades. They advise, inform and design structural aspects of the building, from its overall frame through to individual details such as the size of structural supports or fixings. A structural engineer will demonstrate the viability of the building and rationalise its structural elements so that they are efficient, effective and complement the overall architectural idea.

A mechanical engineer is, broadly, someone who is involved with the design, development and installation of machinery. In building terms this refers to the designer of the building's mechanical, heating and ventilation systems. These systems need to be considered, specific and integrated into the design idea so that they work effectively with the spatial material and formal architectural concepts.

Electrical engineers work very closely with the mechanical engineers to design and oversee the installation of the electrical systems for the building. On larger projects, electrical engineers can work with lighting consultants to provide a specific lighting strategy for the building.

Acoustic engineers deal with aspects of noise control. They understand how sounds move through the building's materials, and can suggest specifications that will affect the user's experience of sound in the building. When buildings need to accommodate many and varied functions, acoustic engineers can advise about separation of structures, such as walls or floors, to reduce sound transmission. Additionally, they can advise on material specifications that can alter sound appreciation in space.

4. All architecture is positioned in a location or context; landscape architects are concerned with connecting a building to its surroundings.

Landscape architects will start by analysing the site to understand specific climatic condition, such as rainfall, amount of sunlight or

temperature range, and to understand the area's indigenous plants and their planting conditions.

Landscape design also considers aspects of the journey and route through the building's external spaces, and the activities associated with those spaces. Good landscape design binds a building into its site, complements all aspects of the architecture and is inseparable from the building.

5. Building contractors physically construct the building, working with information provided by engineers, architects and surveyors. Generally, they are directed by a project manager or architect on site. Some projects may also obtain the services of subcontractors or specialists to make something in a particular way or using a special technique.

Building contractors adhere to a schedule of works that they devise at the start of the project to ensure that the materials, tradesmen and services are all coordinated to allow the building project to progress smoothly. The integration of these different services is critical to the successful completion of the building.

One of the constituents is the brief. The brief is written to limit and define the project specifications, determining aspects of function, construction, materiality and relationship to site. The brief is composed initially as a response to the client's intentions for the site, and is then further developed to provide detailed information about the project requirements, including, among other factors, appraisal of site, accommodation requirements, internal layout requirements and specialised fittings and fixtures.

Another initial thing is the concept, which is the driving idea of the project and it will respond to the architecture's function, site and brief, as well as any historic or typological precedents. Developing the concept from sketch to a fully functional building, one which refers back to and connects with the initial ideas, is a challenge. Because of this, concepts for architectural projects need to be clear and understood by all members of the team so that they can inform and be reinforced at all stages of the project's development.

Site analysis is also very important. It is a process that allows for specific aspects of the project's location to inform the design idea. For example, there may be historical precedents, say in terms of building

design or construction techniques, which are particular to that locality, or climate ranges and average temperatures that may affect the relationship between a building's interior and exterior. All these factors, and more, can affect the design ideas. Analysing and understanding the immediate locality and the surrounding area will allow the design to better connect with both the site and its context.

The process of designing a building is an unpredictable journey. It starts as a concept, perhaps represented as a series of sketches or some models, but as the idea develops, key considerations and decisions have to be made by the client. These will concern the use of individual spaces, the functional requirements of the building and its surroundings, the use of materials, or the heating, ventilation and lighting strategies. The decisions taken on all of these sort of issues should reinforce the initial architectural concept. During the design process it is vital that the key concept is retained and that any decision-making does not compromise the integrity of the idea.

At the stage of detail development in the project, drawings are produced to allow the building to be constructed. These drawings will vary in scale and number; bespoke elements will need lots of detail to explain construction whereas other, more standard, aspects of construction will need little detailed explanation or drawings.

All architecture needs to be imagined by the architect at the start of the project. The interesting aspect of any project is how well this imagined idea connects with the realised building. There are always aspects of architecture that surprise; even with complex physical and CAD models it is not always possible to predict, for example, the sensation of natural light changing the mood in a space. The experience of the interior spaces and how they connect cannot fully be understood until the building is finished. Once completed the success of any piece of architecture will reside on two key factors: does the building suit its intended purpose, and does it respond well to the initial brief?

Text 8

Tasks to Text 8.

I. Read the text. What is this text about?

II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
1. Can you explain what cadaster is?
2. Is cadaster a kind of systematization of buildings?
3. What are the specific features of the cadaster of the 21st century?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

The cadastre is an indispensable tool for regulating objects. According to Henssen, it "is a methodically arranged public inventory of data concerning properties within a certain country or district, based on a survey of their boundaries. Such properties are systematically identified by means of some separate designation. The outlines of the property and the parcel identifier normally are shown on large-scale maps which, together with registers, may show for each separate property the nature, size, value and legal rights associated with the parcel" [1, 2]. This proposed definition is somewhat generic, given the notable diversity of conceptualizations and cadastral models across the EU. The primary characteristic is the heterogeneity in the processing of information, the historical and cultural constraints and the political and administrative organization of each Member State [3]. Comparetti and Raimondi proposed a classification of cadastres in the EU according to the administration and ministries responsible for the cadastre, the relationship between the cadastre and geodesy and general cartography, the identification of real estate (typically based on cadastral parcels), the type of cartography and the link between the cadastre and the land registry (if one exists) [4]. Nonetheless, the criteria used to classify them may be based on other factors, such as the use and purpose, the valuation system, the existence of different cadastres for rural and urban settings and even the peculiarities of each country [5].

Over time, socioeconomic and political changes in Europe have led to different ways of understanding cadastral models. Ting and Williamson (2013) suggest four key stages. First, cadastres functioned as a record of ownership, with fiscal purposes being the main motivation. The concept then shifted, as land became a commodity, meaning the cadaster was obliged to broaden its functions, becoming a land market tool. In the third stage, at the end of the 1940s, in the post-WWII period, it emerged as a record of land parcels and registry of ownership, becoming especially useful for territorial planning. The last stage sees the cadastre functioning as a broader-based tool for territorial management, guided by principles of sustainable development, information and communication technology and economic reforms generated by globalization [6]. In the mid-1990s, the main debate centered on the process of automation, enhancing the importance of the cadastre as part of a wider land information system. According to Enemark and Williamson (2005), most cadastres around the world include aspects related to land value, tax systems and legal rights (albeit with minor differences in some cases), which allow for interaction between the identification of parcels, the registry of land rights and land value and taxation. This form of understanding the structure of cadastral data has given rise to the need to create more extensive definitions, able to reflect such interactions, advocating concepts such as cadastral systems and/or cadastral infrastructures [7].

With the intention of capturing these ideas, the idea of the multi-purpose cadaster (MPC) has gained prominence [8], and it has become a term now in use in the EU, due to the growing need for cadastral data structures. This concept is defined as tool that is “essential to consolidate the country as an articulated territory, integrated and cohesive in the physical, economic and social fields within its natural geographical environment” [9]. The structure of the MPC, which emerged as a development of the modern cadastre, has a much greater scope, as it no longer covers only matters related to the land market. According to Abdul (2000), the MPC generates a feedback system, in which all the users involved (different levels of public administration, public and/or private stakeholders, academic institutions, etc.) benefit from the model’s advantages, while also bolstering its development and improving the system [10]. The cadastre has become the center of any

land administration system, as it exhibits information on the three Rs (rights, restrictions and responsibilities) [11]. The MPC supports land information systems, underpinned by data integration structures with information related to ownership, taxation, administrative questions, natural resources and other data on each individual parcel [12]. In this context, cadastral structures emerge as data sources for use in analyzing urban processes.

Despite their apparent similarity, most countries in Mediterranean Europe "have developed their own cadastral system because there are assumed to be huge differences between the systems" [13]. The situations are varied and are the result of the different conditions of each Member State. Following Mirón Pérez (2000), France, Italy and Spain can be placed in the same category, in which the cadastre is a ministerial responsibility, given that its function is primarily for taxation purposes [14]. Comparetti and Salvatore (2019) also include Belgium and Luxembourg in this group [4], since the main use of the cadastre is related to the competent authority in cadastral matters. Thus, in these cases, cadastral responsibility resides in the Ministry of Finance or the Treasury.

In Italy, Francesco Rizzo underlined, among other things, the importance of unifying the rural and urban cadastres [15–17]. Currently, the Land Cadastre (Cadastre Terreri) and the Urban Building Cadastre (Cadastre Edilizio Urbano) form the basis of the Italian Cadastre [18]. The former includes "the list of all rural properties and unbuilt land plots" [19], whereas the latter covers "buildings for civil, industrial and commercial use" [19]. These are complemented by the Cadastre of Buildings (Cadastre dei Fabbricate), which contains data on both urban and rural constructions [19]. Raimondi, Puccio and Egli (2020) advocate a unified, multi-purpose cadastre, holding a wealth of varied information, with functions that go beyond the traditional ones of identification and classification [20,21]. Among these is guaranteeing more sustainable soil use. To this end, the authors propose a cadastre constructed in three sections: "the urban soil cadastre, extra-urban soil cadaster or land cadastre and the cadastre for the conservation of soil-biodiversity or natural to semi-natural pedodiversity" [22] (p. 2). From the urban perspective, this proposed reform of the cadastral system is justified by the presence of an inefficient model designed for tax

purposes based on a valuation methodology that has become obsolete [23,24].

In France, the current system is based on the Cadastre Napoleonien from 1807, built upon a collection of exact maps of parcels and real estate [25,26]. The public administration is currently in the process of digitizing and creating alphanumeric and graphic databases in coordination with the IGN (National Geographical Institute) [27]. The French Cadastre "applies to all urban and rustic properties (built or not)", and forms an "exhaustive, permanent, descriptive and evaluative inventory of landed property: the cadastre reflects the civil status of built and undeveloped property" [28]. As in Italy and Spain, taxation is the main purpose of the French Cadastre, which gives meaning to the constant revisions and amendments to valuation implemented over the years [29,30]. Bearing in mind its role as a property register, it is worth highlighting its technical, fiscal and property functionality [31]. The official webpage of the French Government [32] provides access to information on parcel limits (the minimum unit of representation), topographic details, hydrographic matters, building details, etc. [33].

In Spain, France and Italy, the cadastre is the competent body for valuation, although only in the first country is there a massive system for the market-based valuation of real estate [3,34]. Thus, the authorities are currently dealing with the challenges of automating and creating cadastral databases, which since the end of the last century have been lent urgency by the emergence of the information society [35]. The disparities between the different EU Member States opened the debate on the need to develop a common framework for action. Since the beginning of the 21st century, the cadastre has been considered a key element of land information systems in Europe [5,36]. The revolution in technology has now paved the way for the geospatial revolution. Not only has the generation of cartographic products been changed by this technological revolution, but also the methods of generating data, the platforms to acquire and exchange geographic data, metadata services, etc. [37, 38]. The 1st Congress on Cadastre in the European Union (2002) marked the start of a common cadastral policy in the EU, enabling Member States to exchange information, experiences and better practices [39].

Text 9

Tasks to Text 9.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
    1. Do the terms ‘cadastre’ and ‘land administration’ mean the same?
    2. How do you understand the term ‘cadastral reform’?
    3. Can you guess what do 3Rs (RRR) mean in relation to cadaster?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

While there has been a considerable amount of documentation on or reference to cadastres for much of the 20th Century, especially in Europe, there continues to be considerable debate as to what constitutes a “cadastre”. To some degree what constitutes a “cadastre” is in the eyes of the beholder. To attempt to clarify the concept the International Federation of Surveyors established a working group in 1992 to develop a “Statement on the Cadastre” (FIG, 1995). The statement defined a cadastre as “…a parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, and ownership or control of those interests, and often the value of the parcel and its improvements.”

While the FIG Statement on the Cadastre was important, it did not fully recognize the role that cadastres play in the operation of land markets. As a result, the United Nations with the support of the FIG developed the “Bogor Declaration on Cadastral Reform” (UN-FIG, 1996). The Bogor Declaration proposed the development of “… modern cadastral infrastructures that facilitate efficient land and property

markets, protect the land rights of all, and support long term sustainable development and land management". It also established principles for re-engineering cadastral systems.

Importantly the Declaration stated that a cadastral infrastructure "… can support a vast array of legal, technical, administrative and institutional options in designing and establishing an appropriate cadastral system, providing a continuum of forms of cadastre ranging from the very simple to the very sophisticated. Such flexibility allows cadastres to record a continuum of land tenure arrangements from private and individual land rights through to communal land rights, as well as having the ability to accommodate traditional or customary land rights." Further it stated that "…The success of a cadastral system is not dependent on its legal or technical sophistication, but whether it protects land rights adequately and permits those rights to be traded (where appropriate) efficiently, simply, quickly, securely and at low cost. However, if the resources are not available to keep the cadastral system up-to-date then there is little justification for its establishment." (UN-FIG, 1996)

As mentioned, the English-speaking world did not fully embrace the cadastral concept until the late 1970s or early 1980s (McLaughlin 1975; NRC, 1983; Williamson, 1983; Dale and McLaughlin, 1986). However, many of the basic principles were adopted much earlier, especially cadastral surveying principles (Dale, 1976; Binns and Dale, 1995; Dowson and Sheppard, 1953). The 1990s has seen many more books, articles and conferences concerned with cadastral systems and cadastral reform, such as the Cadastral Reform Conferences at the University of Melbourne in 1990 and 1992 (also see Larsson, 1991; Dale and McLaughlin, 1999).

With the collapse of the Communist regimes in Eastern and Central Europe, the United Nations Economic Commission for Europe (UNECE) recognised the need for guidelines to assist countries to establish cadastral systems in support of land markets. The UNECE established a Meeting of Officials of Land Administration (MOLA) to develop the Land Administration Guidelines (UNECE, 1996). Due to the importance of land administration in supporting market economies, MOLA has now been upgraded to the Working Party on Land Administration (WPLA).

As a result of the continuing debate as to what constitutes a "cadastre", particularly in Europe, the UNECE adopted the term "land administration" instead of "cadastre". MOLA defined land administration as "the process of determining, recording and disseminating information about the tenure, value and use of land when implementing land management policies" (UNECE, 1996). In this context land administration is considered to include land registration, cadastral surveying and mapping, fiscal, legal and multi-purpose cadastres and parcel-based land information systems, and in many systems, information supporting land use planning and valuation/land taxation systems. For the purposes of this paper the term "cadastre" will be used to describe the core land administration functions of land registration, cadastral mapping, a computerised parcel-based information system together with the information and communication technologies associated with maintaining and accessing the cadastre.

At the same time, the FIG continues to investigate cadastral issues in its Commission 7 (Cadastre and Land Management) (see www.fig.net). In 1994 the Commission established a Working Group to describe a future cadastre in 20 years (Cadastre 2014) (Kaufmann and Steudler, 1998). Cadastre 2014 recognises the changing relationship of humankind to land, the changing role of governments in society, the impact of technology on cadastral reform, the changing role of surveyors in society and the growing role of the private sector in the operation of the cadastre. Importantly Cadastre 2014 emphasises the importance of cadastres being complete and including all public as well as private rights in the cadastre.

Cadastral reform and associated land titling and land administration projects today still emphasise the key role of documenting individual private rights in support of land markets. However, there is a growing recognition in many countries, in organisations such as the United Nations and The World Bank, and with land administration practitioners, that land administration, and particularly the core cadastral system, has an equally important role in supporting sustainable development objectives, rather than the traditionally narrow focus on land markets (Wiebe and Meinzen-Dick, 1998). This resulted in the development of the joint United Nations-FIG

Bathurst Declaration on Land Administration for Sustainable Development (UN-FIG, 1999; Williamson et al, 2000).

The Bathurst Declaration concluded that "most land administration systems today are not adequate to cope with the increasingly complex range of rights, restrictions and responsibilities in relation to land, which are influenced by such factors as water, indigenous land use, noise and pollution". In short, land information and land administration systems need to be re-engineered and to evolve to face the increasing complexity of the humankind-land relationship. They will need to play a fundamental role in facilitating and supporting the complex decision making that is integral to sustainable development. In short sustainable development is just rhetoric without appropriate land administration systems. (UN-FIG, 1999)

Text 10

Tasks to Text 10.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
   1. Does a real estate agent sell property?
   2. What is necessary to start a Real Estate Company?
   3. How are real estate agents paid?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

A licensed real estate agent connects buyers and sellers for transactions and represents them in legal negotiations. Generally, agents are compensated through commission, which is a percentage of the sale of the house. The percentage agents receive depends on their state and brokerage. A brokerage is the managing house for agents, allowing the agents to use the company branding, connections, and legal team. If

you’re interested in a career in real estate, compare the differences between a real estate agent and a real estate broker.

Table 1. Real Estate Agent vs. Real Estate Broker

Broker	Real Estate Agent
Took more training and courses to become a managing broker	Has taken only the steps necessary to get licensed – prelicensing courses and the licensing exam.
Can work independently or own their own brokerage.	Works for a brokerage.
Assists in the backend of sales; the technical and legal details.	Submits offers and negotiates; completes sales.
Capable of doing what the real estate agent does in addition to managing the brokerage.	Works with clients to find them a property.
Can make a commission from selling a home but also gets a portion of their agent's commission.	Earns commission on the sale of a home but has to share the commission with their brokerage.

Managing Your Real Estate Business

There are several administrative tasks a real estate agent does at a well-run real estate business. An excellent real estate agent:

- Keeps up with local and regional market activity and industry news
- Researches active, pending, and sold listings and reviews the daily MLS hot sheet or activity report
- Completes, submits, and files real estate documents, agreements, and records with the proper state agencies
- Plans and coordinates appointments, open houses, showings, and meetings with clients and other real estate agents
- Develops real estate marketing plans for listings and creates fliers, newsletters, and other promotional collateral
- Responds to incoming emails and phone calls
- Update websites, social media profiles, and blogs

- Many successful real estate agents have an assistant or office manager to help with the day-to-day activities, allowing the salesperson or broker to focus on more direct revenue-generating activities.

A real estate company can either be a property management group or a brokerage. A property management company buys commercial properties and turns them into apartments or townhomes. This work is all internal, corporate, or onsite at the property, not always buying or selling a property. On the other hand, an agent at a brokerage helps clients buy or sell a home while following the brokerage's branding. In addition, the agent gains access to the brokerage's resources, such as legal help and backend technical aspects of a sale.

Attracting clients is crucial to a real estate agent's success. Below are some tips to attracting new clients:

- Market yourself. Competition is fierce. You need to develop your personal brand in real estate and be known as an expert in the specialization you enjoy. This will help you differentiate through effective marketing. Websites, postcards, television and radio spots, billboards, fliers, and blogs are all channels that can be utilized in effective real estate agent marketing plans.
- Lead generation. Generate leads through networking and relationship development. This starts with people you know, such as friends, family, business associates, and so on. There is little more valuable to a real estate agent than a thriving database of leads.
- Everyone is a prospect. Everyone you meet is a prospective client because most people either rent, buy, or sell a home at some point in their life. A real estate agent's day is often consumed by cultivating leads and meeting and following up with potential buyers and sellers.

How Real Estate Agents Work with Sellers

- Meet with and understand the needs of sellers with new listings.
- Demonstrate your market knowledge, marketing abilities, and negotiation skills.
- Research the current local market activity and comparable properties to establish an asking price.
- List the property with relevant listing services.
- Take photos of the property – interior and exterior – to prepare a listing presentation and advertising collateral.

- Stage the home properly, so it looks perfect when you conduct open houses.

How Real Estate Agents Work with Buyers

- Meet with, interview, understand, and qualify prospective buyers.
- Research the listing services for potential properties that fit the needs of your clients.
- Plan property showings for buyers, and set up appointments that fit their schedule.
- Show properties to buyers and communicate details of the property you learned during your research or while speaking with other experts (home inspectors, appraisers, and other real estate agents).
- Demonstrate negotiation skills, making offers of purchase on real estate.

What Do Real Estate Agents Do at Closing?

Throughout the process, the real estate agents act as mediators between the buyer and seller. There is typically a final walkthrough just before the closing date to ensure there has not been any damage to the property. The agent also handles negotiations unless the state requires others present during the signing – such as lawyers and title or escrow agents. In addition to conducting negotiations, the agent reviews all contracts and materials for any mistakes and to ensure accuracy.

Networking With Fellow Real Estate Agents

Real estate agents typically work in an office with other agents and brokers. Here, they can discuss new listings, get updates on current listings, and discuss their client's needs. The MLS database is another way agents narrow down a search for a buyer or learn about the competition for sellers. This allows agents and brokers to quickly gather first-hand knowledge on properties available in the local market.

How Do Real Estate Agents Get Paid?

Agents earn a commission which is a percentage of the property's sale price. However, they have to give their broker a cut as well. A broker can make a commission from selling a home like an agent. But if they own the brokerage, they get a portion of their agent's commission.

How Much Do Real Estate Agents Make?

As in any career, compensation or salary can differ between positions or even for the same position – the same is true for real estate

agents. According to Andrew DePierto of Forbes magazine, on average, a real estate agent in 2019 was making $41,200 annually. However, in 2019, the demand was extremely low for moving. It wasn't until after the pandemic's effects subsided that the housing market took off. According to Indeed, the average established agent's salary is $86,000 as of March 2021.

Remember, a real estate agent's income is not limited by an hourly wage or a corporate-dictated salary range. As a real estate salesperson, your income is primarily dictated by the time you invest, how hard you work, and ultimately how many houses you sell. You can grow your real estate business (at your own pace) by adding an assistant or getting the appropriate license that allows you to build and own a brokerage.

Developing Your Real Estate Skills

Continuing education isn't just a requirement to maintain a real estate license. It's also a way to develop skills that keep an agent at the top of their game and open doors to new real estate opportunities within their market. Ongoing development and growth are crucial to the long-term success of real estate agents and brokers. Continuing education not only widens their scope of expertise, but it also improves their proficiency, knowledge, and marketability as a real estate professional.

Text 11

Tasks to Text 11.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
    1. Which factors influence real estate valuation?
    2. Can the results of real estate valuation change with time?
    3. What are the methods for real estate valuation?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Real-estate valuation is the task of appraising the prospective price of a site or building in the case of a sale. Such appraisals are important for investment decisions, for real-estate funds and project developments [1].

In general, real-estate valuation is independent, neutral and objective estimation of a real-estate, a real-estate project or rights and benefits of a real-estate, on the day of the valuation [2].

The value of many goods and services are generally determined with a single value due to ignore of the competitive conditions. However, there is no single value like that for real-estates that considered as an economic investment vehicle. And also, the prediction of the rate of changes in values is very complex problem. Because of this, the different values come up with the same real-estates in our country. Whereas, a certain period of time, real-estate must have a single value. Even if the value of real-estate determined with different approaches, these values are expected to be close to each other in an acceptable range [3].

In fact, it is not possible to determine precisely the value of a real-estate. Because, every real-estate has different features due to the location and the usage of it and these features may vary from person to person in terms of quality and quantity and obtaining precise value becomes a complex problem. However, it is possible to find estimated values instead of exact values. Hence, some elected objective and subjective criteria, are evaluated separately. These valuations, done per unit area or volume are then reflected in the entire real-estate. For this reason primarily, real estate’s value criteria should be classified [4]. Some of the criteria taken into account in the evaluation of any real-estate are given below:

1) Intended use of real-estate;
2) Environmental Specifications;
3) Location of real-estate
    - Transportation and proximity of the areas that given public service
    - The distance to shopping malls
    - The distance to the areas of education and worship
    - The distance to the unhealthy and harmful areas
    - Noise

- The distance to historical sites;

4) Locational Properties
   - Topographical structure
   - Soil structure
   - Shape and size of the parcel
   - Facade use

5) Scenery.

Real-estate valuation is carried out by independent and professional valuation experts at developed western countries. The value which is determined by the experts may be such as the normal commerce value, the marketing price, the sale price, demand value etc. and this value is determined by using a variety of methods.

Residential real-estate valuation methods are classified into three as: traditional valuation methods, statistically valuation methods and advanced valuation methods [5]:

1) Traditional Valuation Methods
   - Comparison Method
   - Income Method
   - Cost Method
   - Benefit Method;

2) Statistically Valuation Method
   - Multiple Regression Method
   - Hedonic Pricing Method
   - Spatial Analysis Method

3) Advanced Valuation Methods
   - Artificial Neural Networks
   - Fuzzy Logic
   - Autoregressive Integrated Moving Average Method (ARIMA)

The traditional methods are usually based on the comparison principle and not appropriate for automatic valuation as they use a very limited data in similar groups of real-estates. Due to factors like the difficulty in finding residential real-estate similar to the considered real-estate, having many factors affecting the price, variability due to local regions and preferences, and the difficulty in defining the situation with common mathematical equations which are encountered in value estimation with traditional valuation methods, the statistical and the advanced valuation methods have been developed.

Artificial intelligence methods and application areas are divided into many different subjects. Of the advanced valuation methods using artificial intelligence methodologies (such as ANN, FIS, ANFIS etc.), ANN has been reported as an appropriate approach in determining the values of real estate [6-13]. Regression analysis and correlation are applied in many fields such as Domestic Product, loan payment and Measuring Service Quality [14-17]. Regression, especially multiple regression analysis (MRA) is one of the well-known statistical methods in which many criteria affecting the valuation of real-estates are involved, each of which having a different effect on the value [18-20]. MRA is a technique that allows additional factors to enter the analysis separately so that the effect of each can be estimated. It is valuable for quantifying the impact of various simultaneous influences upon a single dependent variable [21]. Linear MRA method has been generally used for this purpose in the literature.

In real estate valuation, many criteria are taken in the account. This process also leads to complexity. Therefore, attribute reducing needed. In this study, for attribute reducing correlation was used, the success of the method was tested by using Multiple Regression Analysis (MRA).

Text 12

Tasks to Text 12.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
   1. In what way can heat demand be reduced?
   2. What is heat recovery?
   3. What is the objective of the article?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

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Buildings are a key sector in terms of energy users. Their exploitation and maintenance currently consume up to 40% of the total energy demand in the world [1,2,3,4,5,6]. Heating, ventilation and air conditioning (HVAC) systems account for 40–60% of a building's energy needs [7,8,9,10], and the ventilation systems themselves account for 20–30% [11]. The heat demand can be reduced by reducing the building's heat loss by insulating and sealing the building envelope. However, such actions have consequences in the form of reduced air exchange, and deterioration of indoor air quality (IAQ). This in turn has a negative impact on the performance and health of people staying in the room [12,13,14,15]. In order to improve the air quality in rooms, mechanical ventilation is used, where a large amount of heat is lost with the exhaust air. In order to reduce energy consumption, the heat energy contained in the exhaust air stream is recovered. Its efficiency varies depending on the airflow (more airflow means less efficiency) and the temperature difference between outside and inside (higher gradient means better efficiency). Likewise, the way the air is distributed in the room is important. In the process of designing an installation, it is assumed that fresh air and indoor air are ideally mixed if the flows specified in the regulations are adopted. In fact, with different locations of air inlets and outlets, the air may not be renewed, and this results in an increase in the amount of air to achieve a minimum IAQ. This obviously increases the amount of energy consumed. A further increase in energy consumption results from the use of highly efficient filters that remove dust particles, which are currently the main public problem [16,17].

At the same time, it should be noted that the energy consumption of the building sector will continue to grow. New buildings start using energy, while the energy consumption of existing buildings never falls but remains constant or rises. In order to globally reduce energy consumption and CO^2 emissions, old buildings should be modernised [18,19,20,21]. Installation of centralised ventilation systems may not be possible in this case [22,23,24,25], but there are options to reduce

energy consumption. For this purpose, hybrid ventilation systems or decentralised facade ventilation can be used [26,27,28,29]. The latter make it possible to adjust the capacity to the current needs of the amount of fresh air. Because of the lack of ventilation ducts, they are equipped with small fans, which translates into low pressure losses [30].

Heat occurs in sensible and latent form. The sensible form of heat is that where temperature change is visible during the flow of heat. In turn, latent heat is the heat recovered from the moisture contained in the air stream. Commonly-used devices enable the recovery of sensible or total heat, i.e., the sum of sensible and latent heat [31,32,33,34,35,36].

The ventilation systems with heat recovery as a way to reduce the consumption of heat and cooling energy have been known since the 1970s [37]. The use of heat recovery in airtight buildings can reduce the annual energy consumption for heating and cooling by up to one-third [38,39,40]. The Energy for Buildings Directive (EPBD) even imposes an obligation to use heat recovery in mechanical ventilation systems [41]. The "Ecodesign" Directive [42] imposes requirements in the European Union on the efficiency of heat recovery. In the case of intermediate systems, it is 68% and for the remainder is it 73%. Each investment in the heat recovery depends on profitability, building regulations and the scope of the renovation. Carlsson et al. [43] found on the basis of the conducted research that the combination of modernisation consisting in sealing the building envelope and the use of the ventilation with the heat recovery allows for a 78% reduction in total energy for space heating and 83% reduction in greenhouse gas emissions.

The ventilation heat recovery devices include rotating thermal wheels, plate exchangers, heat pipes, run-around systems and heat pumps. Each type of heat recovery device has its own advantages, disadvantages and respective applications. The building attributes define the type of heat recovery equipment to be installed [25]. Air handling units with heat recovery can bring significant final and primary energy savings. However, the profitability of the analysed units with heat recovery differs significantly depending on the energy efficiency level of the building and the heat supply, the frost level, the energy price development and the real discount rate used for the analysis [44].

In the literature there are a review of types of the heat recovery exchangers and the review of the physical and performance parameters

of heat exchangers. There is no review that indicates the types of ventilation systems where heat recovery has not been sufficiently investigated. The review described in the literature do not include the influence of climate on the heat recovery. The article reviews the available heat recovery technologies, the parameters that affect the amount of heat recovery, and the methods of assessing its effectiveness. The aim of the article was to show the gaps in research on heat recovery, to show what else should be investigated and what is not described in the literature.

Text 13

Tasks to Text 13.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
   1. What is understood by water system?
   2. When did people start to purify water?
   3. What are Water quality standards used for?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

Water supply system is infrastructure for the collection, transmission, treatment, storage, and distribution of water for homes, commercial establishments, industry, and irrigation, as well as for such public needs as firefighting and street flushing. Of all municipal services, provision of potable water is perhaps the most vital. People depend on water for drinking, cooking, washing, carrying away wastes, and other domestic needs. Water supply systems must also meet requirements for public, commercial, and industrial activities. In all cases, the water must fulfill both quality and quantity requirements.

In addition to quantity of supply, water quality is also of concern. Even the ancients had an appreciation for the importance of water purity. Sanskrit writings from as early as 2000 BCE tell how to purify foul water by boiling and filtering. But it was not until the middle of the 19th century that a direct link between polluted water and disease (cholera) was proved, and it was not until the end of that same century that the German bacteriologist Robert Koch proved the germ theory of disease, establishing a scientific basis for the treatment and sanitation of drinking water.

Water treatment is the alteration of a water source in order to achieve a quality that meets specified goals. At the end of the 19th century and the beginning of the 20th, the main goal was elimination of deadly waterborne diseases. The treatment of public drinking water to remove pathogenic, or disease-causing, microorganisms began about that time. Treatment methods included sand filtration as well as the use of chlorine for disinfection. The virtual elimination of diseases such as cholera and typhoid in developed countries proved the success of this water-treatment technology. In developing countries, waterborne disease is still the principal water quality concern.

In industrialized countries, concern has shifted to the chronic health effects related to chemical contamination. For example, trace amounts of certain synthetic organic substances in drinking water are suspected of causing cancer in humans. Lead in drinking water, usually leached from corroded lead pipes, can result in gradual lead poisoning and may cause developmental delays in children. The added goal of reducing such health risks is seen in the continually increasing number of factors included in drinking-water standards.

Municipal water supply systems include facilities for storage, transmission, treatment, and distribution. The design of these facilities depends on the quality of the water, on the particular needs of the user or consumer, and on the quantities of water that must be processed.

Water has such a strong tendency to dissolve other substances that it is rarely found in nature in a pure condition. When it falls as rain, small amounts of gases such as oxygen and carbon dioxide become dissolved in it; raindrops also carry tiny dust particles and other substances. As it flows over the ground, water picks up fine soil particles, microbes, organic material, and soluble minerals. In lakes,

bogs, and swamps, water may gain colour, taste, and odour from decaying vegetation and other natural organic matter. Groundwater usually acquires more dissolved minerals than does surface runoff because of its longer direct contact with soil and rock. It may also absorb gases such as hydrogen sulfide and methane. In populated areas the quality of surface water as well as groundwater is directly influenced by land use and by human activities. For example, stormwater runoff contaminated with agricultural or lawn pesticides and fertilizers, as well as with road deicing chemicals or motor oil, can flow into streams and lakes. In addition, effluent from malfunctioning septic tanks and subsurface leaching fields can seep into groundwater.

Water quality standards set limits on the concentrations of impurities allowed in water. Standards also affect the selection of raw water sources and the choice of treatment processes. The development of water quality standards began in the United States in the early 20th century. Since that time, the total number of regulated contaminants has increased as toxicological knowledge and analytical measurement techniques have improved. Modern testing methods now allow the detection of contaminants in extremely low concentrations—as low as one part contaminant per one billion parts water or even, in some cases, per one trillion parts water. Water quality standards are continually evolving, usually becoming more stringent. As a result, the number of regulated contaminants increases over time, and their allowable concentrations in water are lowered.

Drinking-water regulations in the United States include two types of standards: primary and secondary. Primary standards are designed to protect public health, whereas secondary standards are based on aesthetic factors rather than on health effects. Primary standards specify maximum contaminant levels for many chemical, microbiological, and radiological parameters of water quality. They reflect the best available scientific and engineering judgment and take into account exposure from other sources in the environment and from foods. Turbidity is also included in the primary standards because of its tendency to interfere with disinfection. Secondary standards are guidelines or suggested maximum levels of colour, taste, odour, hardness, corrosiveness, and certain other factors.

Text 14

Tasks to Text 14.

I. Read the text. What is this text about?
II. Define the type or combination of the types of the text.
III. Define the scheme or combination of the schemes of the text.
IV. Make the semantic model of the text.
V. Find key words.
VI. Make a graph of the text.
VII. Answer the questions:
   1. What are the main elements of water distribution system?
   2. What kind of patterns are used for pipelines?
   3. Can you name any kinds of fittings and explain what they are used for?
VIII. Put three questions to the text.
IX. Write the summary of the text.
X. Entitle the text.
XI. Translate the text.

A water distribution system is a network of pumps, pipelines, storage tanks, and other appurtenances. It must deliver adequate quantities of water at pressures sufficient for operating plumbing fixtures and firefighting equipment, yet it must not deliver water at pressures high enough to increase the occurrence of leaks and pipeline breaks. Pressure-regulating valves may be installed to reduce pressure levels in low-lying service areas. More than half the cost of a municipal water supply system is for the distribution network.

The pipeline system of a municipal water distribution network consists of arterial water mains or primary feeders, which convey water from the treatment plant to areas of major water use in the community, and smaller-diameter pipelines called secondary feeders, which tie in to the mains. Usually not less than 150 mm (6 inches) in diameter, these pipelines are placed within the public right-of-way so that service connections can be made for all potential water users. The pipelines are usually arranged in a gridiron pattern that allows water to circulate in interconnected loops; this permits any broken sections of pipe to be isolated for repair without disrupting service to large areas of the community. “Dead-end” patterns may also be used, but they do not

permit circulation, and the water they provide is more susceptible to taste and odour problems because of stagnation.

A water distribution pipeline must be able to resist internal and external forces, as well as corrosion. Pipes are placed under stress by internal water pressure, by the weight of the overlying soil, and by vehicles passing above. They may have to withstand water-hammer forces; these occur when valves are closed too rapidly, causing pressure waves to surge through the system. In addition, metal pipes may rust internally if the water supply is corrosive or externally because of corrosive soil conditions.

Distribution pipes are made of asbestos cement, cast iron, ductile iron, plastic, reinforced concrete, or steel. Although not as strong as iron, asbestos cement, because of its corrosion resistance and ease of installation, is a desirable material for secondary feeders up to 41 cm (16 inches) in diameter. Pipe sections are easily joined with a coupling sleeve and rubber-ring gasket. Cast iron has an excellent record of service, with many installations still functioning after 100 years. Ductile iron, a stronger and more elastic type of cast iron, is used in newer installations. Iron pipes are provided in diameters up to 122 cm (48 inches) and are usually coated to prevent corrosion. Underground sections are connected with bell-and-spigot joints, the spigot end of one pipe section being pushed into the bell end of an adjacent section. A rubber-ring gasket in the bell end is compressed when the two sections are joined, creating a watertight, flexible connection. Flanged and bolted joints are used for aboveground installations.

Plastic pipes are available in diameters up to 61 cm (24 inches). They are lightweight, easily installed, and corrosion-resistant, and their smoothness provides good hydraulic characteristics. Plastic pipes are connected either by a bell-and-spigot compression-type joint or by threaded screw couplings.

Precast reinforced concrete pipe sections up to 366 cm (12 feet) in diameter are used for arterial mains. Reinforced concrete pipes are strong and durable. They are joined using a bell-and-spigot-type connection that is sealed with cement mortar. Steel pipe is sometimes used for arterial mains in aboveground installations. It is very strong and lighter than concrete pipe, but it must be protected against corrosion with lining of the interior and with painting and wrapping of the

exterior. Sections of steel pipe are joined by welding or with mechanical coupling devices.

In order to function properly, a water distribution system requires several types of fittings, including hydrants, shutoff valves, and other appurtenances. The main purpose of hydrants is to provide water for firefighting. They also are used for flushing water mains, pressure testing, water sampling, and washing debris off public streets.

Many types of valves are used to control the quantity and direction of water flow. Gate valves are usually installed throughout the pipe network. They allow sections to be shut off and isolated during the repair of broken mains, pumps, or hydrants. A type of valve commonly used for throttling and controlling the rate of flow is the butterfly valve. Other valves used in water distribution systems include pressure-reducing valves, check valves, and air-release valves.

Water mains must be placed roughly 1 to 2 metres (3 to 6 feet) below the ground surface in order to protect against traffic loads and to prevent freezing. Since the water in a distribution system is under pressure, pipelines can follow the shape of the land, uphill as well as downhill. They must be installed with proper bedding and backfill. Compaction of soil layers under the pipe (bedding) as well as above the pipe (backfill) is necessary to provide proper support. A water main should never be installed in the same trench with a sewer line. Where the two must cross, the water main should be placed above the sewer line.

Many kinds of pumps are used in distribution systems. Pumps that lift surface water and move it to a nearby treatment plant are called low-lift pumps. These move large volumes of water at relatively low discharge pressures. Pumps that discharge treated water into arterial mains are called high-lift pumps. These operate under higher pressures. Pumps that increase the pressure within the distribution system or raise water into an elevated storage tank are called booster pumps. Well pumps lift water from underground and discharge it directly into a distribution system.

Most water distribution pumps are of the centrifugal type, in which a rapidly rotating impeller adds energy to the water and raises the pressure inside the pump casing. The flow rate through a centrifugal pump depends on the pressure against which it operates. The higher the pressure, the lower the flow or discharge. Another kind of pump is the

positive-displacement type. This pump delivers a fixed quantity of water with each cycle of a piston or rotor. The water is literally pushed or displaced from the pump casing. The flow capacity of a positive-displacement pump is unaffected by the pressure of the system in which it operates.

Distribution storage tanks, familiar sights in many communities, serve two basic purposes: equalizing storage and emergency storage. Equalizing storage is the volume of water needed to satisfy peak hourly demands in the community. During the late night and very early morning hours, when water demand is lower, high-lift pumps fill the tank. During the day, when water demand is higher, water flows out of the tank to help satisfy the peak hourly water needs. This allows for a uniform flow rate at the treatment plant and pumping station. Water in a distribution storage tank may also be needed for fighting fires, cleaning up accidental spills of hazardous materials, or other community emergencies. The capacity of a distribution storage tank is designed to be about equal to the average daily water demand of the community.

Distribution storage tanks are built at ground level on hilltops higher than the service area. In areas with flat topography, the tanks may be elevated aboveground on towers in order to provide adequate water pressures, or ground-level storage tanks with booster pumping may be provided.

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